Richmond

(as ~~requested~~ recieved)

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ATIA - 19(1)

Jacaban2, Evalynne (INFC)

From: Tambellini,Denise A <DTambellini@richmond.ca>
Sent: March 8, 2019 1:39 PM
To: SC / VI (INFC)
Cc: Tambellini,Denise A
Subject: Re: Smart Cities Challenge - Successful Final Proposal Submission

Good morning,

This is the full link to the final proposal on the smartcity.richmond.ca<http://smartcity.richmond.ca> website.

http://smartcity.richmond.ca/wp-content/uploads/2019/03/COR-SC-PROPOSAL-FINAL.pdf

Please let me know if you have questions or require more information.

With kind regards,
Denise Tambellini
[redacted]

Sent from my iPhone

On Mar 7, 2019, at 10:38 AM, Fedoruk,Lisa <LFedoruk@richmond.ca<mailto:LFedoruk@richmond.ca>> wrote:

Hi Denise,

Katie had approached me about getting some info for an update to the Economic Advisory Committee. I asked Katie to include you in the meeting, as you've raised some good points about the website that Katie might be able to provide some comments on. Ted, would you like to be part of that conversation as well?

Thanks!
Lisa

From: Tambellini,Denise A
Sent: Thursday, 7 March 2019 09:55
To: Fengstad,Grant
Cc: Townsend, Ted; [redacted] Fedoruk,Lisa; Gilfillan,Cindy
Subject: Re: Smart Cities Challenge - Successful Final Proposal Submission

Many thanks!

Is there any way we can have the appendix links imbedded in the proposal? As well as the links to our partners websites?

Denise
Sent from my iPhone

On Mar 7, 2019, at 9:23 AM, Fengstad,Grant <gfengstad@richmond.ca<mailto:gfengstad@richmond.ca>> wrote:
This is the full link to the final proposal on the smartcity.richmond.ca<http://smartcity.richmond.ca> website.

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http://smartcity.richmond.ca/wp-content/uploads/2019/03/COR-SC-PROPOSAL-FINAL.pdf

From: Denise Tambellini <DTambellini@richmond.ca<mailto:DTambellini@richmond.ca>>
Date: Thursday, March 7, 2019 at 9:20 AM
To: "Townsend, Ted" <TTownsend@richmond.ca<mailto:TTownsend@richmond.ca>>, [redacted]
Cc: "Fengstad,Grant" <gfengstad@richmond.ca<mailto:gfengstad@richmond.ca>>, "Fedoruk,Lisa" <LFedoruk@richmond.ca<mailto:LFedoruk@richmond.ca>>, "Gilfillan,Cindy" <CGilfillan@richmond.ca<mailto:CGilfillan@richmond.ca>>
Subject: Fwd: Smart Cities Challenge - Successful Final Proposal Submission

Good morning,

Can you please send me the functioning link to our proposal. It looks like they will be posting only the executive summaries of all the finalists and then linking to our website so we may need to up our game a bit.

Can we make sure we have a section on our website for letters of support and background for the select appendices like the bog fire assessment. I do not think we need to post any financial information but some of the other sections might be helpful to help us gain traction especially as we present to the B.C. Tech summit next week and our chamber, international interest...i.e the procurement appendix.

Perhaps we add a section at the top of the website for business interest and include opportunities like our procurement and work with MDA anything on B.C. Bid etc.? It will give us a more transparent reach out to business. I am meeting with Katie and the Port today so maybe they will have some ideas as well.

I think we are going to need to keep ahead of the game and look like we are still very active right up to May.

Thanks!
Denise

Sent from my iPhone

Begin forwarded message:
From: "SC / VI (INFC)" <infc.sc-vi.infc@canada.ca<mailto:infc.sc-vi.infc@canada.ca>>
Date: March 7, 2019 at 8:59:16 AM PST
To: "Dtambellini@richmond.ca<mailto:Dtambellini@richmond.ca>" <Dtambellini@richmond.ca<mailto:Dtambellini@richmond.ca>>
Subject: Smart Cities Challenge - Successful Final Proposal Submission Dear Denise,

Congratulations! Your submission is ready to move onto evaluation following a completeness check (per the latest FAQs).

Thank you for your cooperation, patience, and hard work, especially during the past eight months. We are truly honoured to have worked with you and wish you the best of luck in the competition!

On a related matter, we have recently determined that it will not be feasible to post final proposals on the Infrastructure Canada website in a timely manner. Instead, we will take an approach similar to the application stage and publish your executive summary in both official languages on the Infrastructure Canada website with a link to the final proposal on your website. We understand that posting the final proposal on your website is not a requirement contained in the finalist guide so we appreciate your cooperation in facilitating access to your final proposal in an open

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and transparent way. Please note that the accessibility materials you have prepared for your final proposal will still be helpful in preparing various communications products to promote and share knowledge of your work.

Once you have posted your final proposal on your website, please send us the link if you haven't done so already. If you anticipate that you will be unable to post your final proposal on your website within two weeks, please let us know.

As always, we are happy to answer any questions. The best way to reach us going forward would be at our generic account: infc.sc-vi.infc@canada.ca<mailto:infc-sc.vi-infc@canada.ca>.

Thank you.

Smart Cities Challenge Team
Infrastructure Canada
infc.sc-vi.infc@canada.ca<mailto:infc.sc-vi.infc@canada.ca>

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COMPLETE CHECK FOR FINAL PROPOSAL

FINALIST: City of Richmond				
ASSESSED BY: Kathleen Bouchard				
VALIDATED BY: Susan Hwang				
APPROVAL BY: Eric Poirier				
DATE OF COMPLETION: March 6, 2019				
REQUIREMENTS	**COMPLETED**	**IF NOT COMPLETED, NOTE REASON**	**GUIDING PRINCIPLES**	**ACTIONS**
		SUBMISSION		
Submitted to infc.sc-vi.infc@canada.ca by 23:59 PST on March 5, 2019	☒		• No extensions will be granted • No exceptions will be made for lateness or technical problems (finalist must be able to show evidence of submission)	• # to contact finalist • If not resolved, # to flag to DG for decision
Final proposal is submitted	☒		• No extensions will be granted • There is flexibility on the finalist video until the end of the week	• Assessor to save everything in designated folders • # to contact finalist if anything is missing • If not resolved, # to flag to DG for decision
Finalist video is submitted	☒		• There is flexibility on the finalist video until the end of the week	• Assessor to save everything in designated folders • # to contact finalist if anything is missing • If not resolved, # to flag to DG for decision
Preliminary Privacy Impact Assessment or Preliminary Rationale Analysis	☒		• No extensions will be granted	• Assessor to save everything in designated folders • # to contact finalist if anything is missing • If not resolved, # to flag to DG for decision
		FINAL PROPOSAL		
Written in one of Canada's official languages	☒		• If the final proposal is submitted in a language other than English or French, a companion version in English or French is required from the finalist	• # to extract the executive summary from the final proposal and send it to translation (if a French final proposal, send the entire document to translation)
Generally readable (e.g. picture is not covering text, text are not overlapping)	☒		• If there are serious formatting issues that hinders readability, the finalist may need to resubmit	• # to do a scan of the final proposal and verify that all text and tables, graph, etc. could be read
Text-based and in either MS Word (.doc or .docx) or a fully readable, searchable, and selectable PDF (.pdf) format	☒		• Finalist may adjust the format for INFC posting purposes after the deadline	• # to verify with Comms if format is suitable for posting, given INFC web accessibility standards • If not suitable, # to contact finalist
No longer than 75 pages* (Financial chapter exempted) and in 12 point font	☒	82 pages (minus 7 pages for the financial chapter) ;	• Finalist cannot adjust content after the deadline • If the text overall is smaller than 12 point font, INFC	• # to notify finalist if final pro … 75 pages • # t … h… p…

			will adjust and evaluate within the new page count	
Contains an executive summary	☒			• # to QC and save translated version into the designated folder
Organized by these distinct chapters (not limited to these; not necessarily in the same order): • Vision • Performance measurement • Project management • Technology • Governance • Engagement • Data and privacy • Financial • Implementation phase requirements	☒	*Also make a note of other chapters, if any*	• Finalist must have these chapters • Finalist can have more chapters • Finalist can change the order of the chapters	• If the chapters are not clearly labeled, # to do a light analysis of where the content may be and make a note for the Jury
FINALIST VIDEO				
No longer than five minutes	☒		• Finalist may cut down the time for INFC posting purposes after the deadline	• # to notify finalist if video is longer than five minutes and needs cutting down
Submitted as a file or in a downloadable format	☒		• Finalist may adjust the format for INFC posting purposes after the deadline	• # to verify with Comms if format is suitable for posting, given INFC web accessibility standards • If not suitable, # to contact finalist
CONFIDENTIAL ANNEX (OPTIONAL)				
Submitted if and only if required	☒			• # to flag with DG if confidential annex is lengthy

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ATIA - 20(1)(b)

ATIA - 13(1)(d)

Jacaban2, Evalynne (INFC)

From: Tambellini,Denise A <DTambellini@richmond.ca>
Sent: March 6, 2019 1:45 AM
To: SC / VI (INFC)
Subject: Final Proposal - City of Richmond

Good evening,

Please find below our Smart Cities Challenge submission links:

Primary: [redacted]

Backup: [redacted]

We are honoured to present our proposal and we look forward to hearing from you.

Let me know if you have questions or require more information.

I will be the main contact for our proposal.

With kind regards,

Denise A Tambellini
Manager Intergovernmental Relations
City of Richmond
604-340-9373

City of Richmond

Malcolm D. Brodie
Mayor
6911 No. 3 Road
Richmond, BC V6Y 2C1
Telephone: 604-276-4123
Fax No: 604-276-4332
www.richmond.ca

February 28, 2019

Smart Cities Challenge
c/o Infrastructure Canada
Government of Canada
Ottawa, Ontario

Attention – Members of the Jury, Smart Cities Challenge

RE: Submission to the Smart Cities Challenge 2019

It is my pleasure to present the City of Richmond's submission to the Government of Canada's Smart Cities Challenge. We commend Infrastructure Canada on their leadership in this program.

Richmond is proud to have been selected as a finalist. The process of developing our Final Proposal has been transformational for the City. Our Challenge statement is:

> *"Richmond, an island city with a rapidly growing and diverse population and home of nationally significant infrastructure and government services, requires physical and virtual platforms that are integrated seamlessly across all levels of government to enhance quality of life in day-to-day activities and minimize community impacts from major disasters."*

Together with our partners, we have developed a five year plan to create enhanced situational awareness to protect our island city against the impacts of climate change. We will improve mobility of people and goods, create more informed decisions for both everyday situations and emergency response, integrate communications and strengthen community resilience.

Richmond has a reputation for excellence, a corporate culture built on innovation and a track record of honouring the commitments we make, such as delivering the premiere venue and legacy facility of the 2010 Olympic Games: the Richmond Olympic Oval. Our commitment to continuous improvement is reflected in our Smart Cities proposal.

Thank you for your positive consideration of this outstanding initiative.

Yours truly,

Malcolm D. Brodie
Mayor

6138180

Richmond

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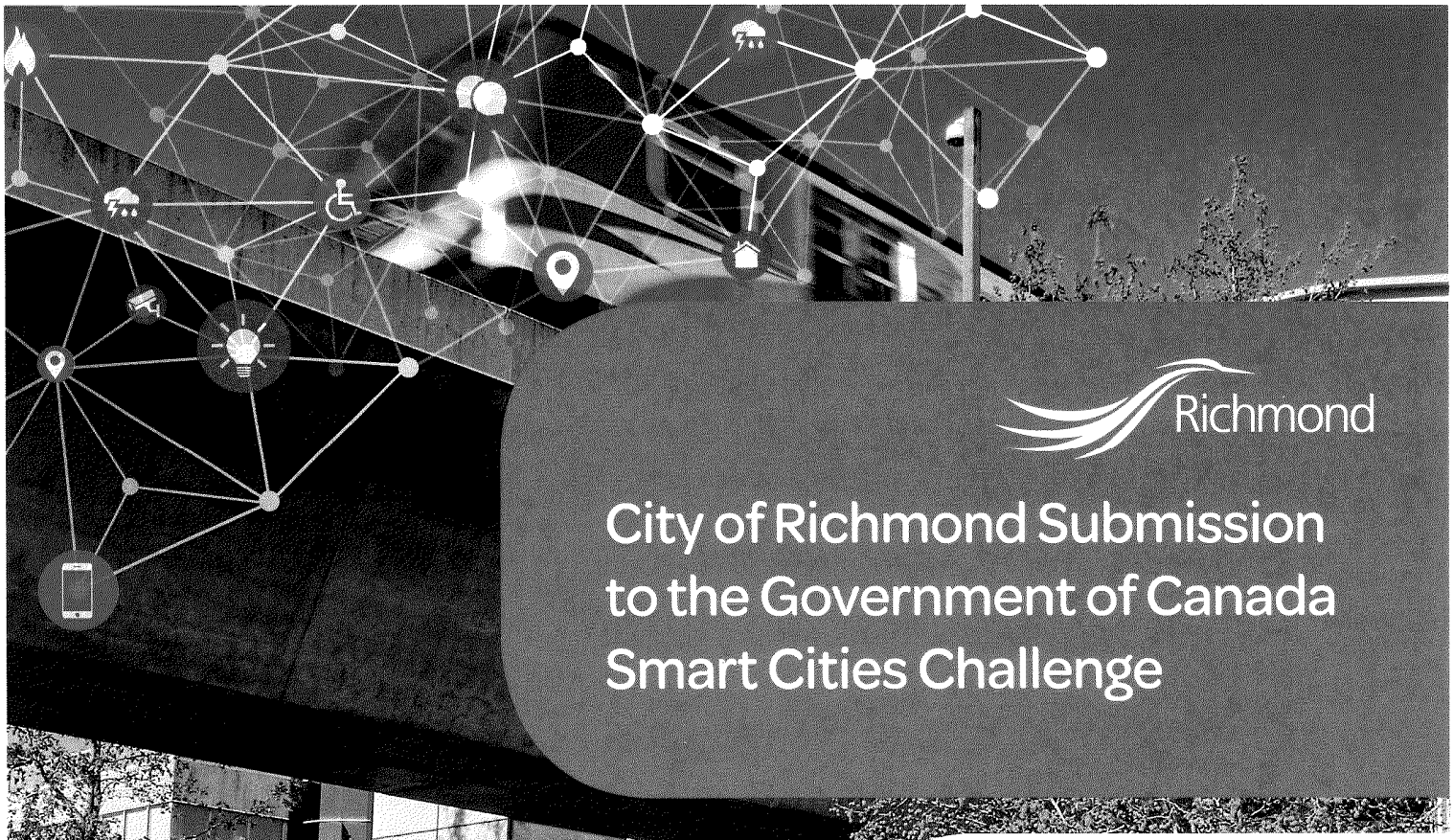

Richmond

City of Richmond Submission to the Government of Canada Smart Cities Challenge

Our Challenge Statement

"Richmond, an island city with a rapidly growing and diverse population and home of nationally significant infrastructure and government services, requires resilient physical and virtual platforms that are integrated seamlessly across all levels of government to enhance quality of life in day-to-day activities and minimize community impacts from major disasters."

March 5, 2019

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EXECUTIVE SUMMARY

The City of Richmond has developed a transformative and ground-breaking proposal for the Smart Cities Challenge. It will minimize community impacts from major disasters, while also enhancing our quality of life in day-to-day activities.

Working together with other levels of government and the private and academic sectors, we will integrate our mutual technology and data to protect our island city against the impacts of climate change. We will enhance mobility of people and goods, enable more informed decision making for both everyday situations and emergency response, integrate communications and strengthen community resilience.

Our proposal builds upon the City's award-winning best practices in flood protection, sustainability and emergency response. It draws upon Richmond's record of excellence, a corporate culture built on innovation and a track record of honouring the commitments we make, like delivering the premier venue of the 2010 Olympic Games on time and on budget.

Implementing our Smart Cities vision will further transform Richmond. It will secure our future as a dynamic, informed community, made more resilient by using digital technology to bring the best of our City's resources together.

Our engagement during the Finalist Phase has already resulted in private sector innovation and investment to help test our Smart Cities solutions. This includes an exciting collaboration with MDA Corporation under the Federal Innovation Superclusters Initiative program, that has also attracted local and international businesses, and provincial government support. As we expand our focus of how we collaborate, we know this is only the beginning of many more partnerships.

Our Smart Cities journey has important lessons learned that are replicable and will benefit all cities, communities, and people across Canada.

What follows is our Smart Cities Challenge Finalist Submission that:

- Summarizes our overall solution;
- Illustrates how our Challenge Statement and outcomes flow through each aspect of our project; and
- Demonstrates how we will implement the City of Richmond's Smart Cities solution over the next five years.

Thank you.

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EXECUTIVE SUMMARY

1. VISION

Our proposal is designed to achieve our vision statement: "Together with our community, government, academic and technology team we will identify and mitigate risk and improve the day-to-day quality of life for residents and businesses on our island." The achievement of our vision statement will result in the following outcomes:

I. **Protect our Island City**

II. **Enable More Informed Decision-Making**

III. **Integrate Communications and Enhance Community Resilience**

2. PERFORMANCE MEASUREMENT

Richmond is already a best practice leader in flood mitigation, sustainability and emergency response. Our Smart Cities projects were specifically designed to achieve identified outcomes to take our City and the integrated work of our partners, to a higher level of functioning, setting a new standard for municipal governments across Canada. We will measure our success through qualitative and quantitative indicators to ensure we are on track and continue to improve the quality of life for residents and businesses in Richmond.

3. PROJECT MANAGEMENT

We have established a robust project management structure to oversee and manage project planning and implementation, project risks, and partner/stakeholder relationships. We are guided by comprehensive Project Implementation Plans to define how each project will be executed, monitored, controlled, and closed.

4. TECHNOLOGY

Our plan outlines how technology can increase operational situational awareness. Our plan will be achieved through innovative partnerships and test cases including the Innovation Superclusters Initiative project team led by MDA and work conducted by UrbanLogiq, TIBCO, TELUS and others. We will collect data from new and existing data sources and develop machine learning-based predictive models to identify and mitigate risk. We will partner with the Province and other key stakeholders to share data and information for research and analysis. Technology will also enable enhanced communication with our diverse population.

5. GOVERNANCE

We have established a governance structure which includes a strong coalition of more than 25 academic, government and technology advisors. We all are committed to achieving project outcomes aligned with the Smart Cities principles of Openness, Integration, Transferability and Collaboration.

6. ENGAGEMENT

Community engagement is a key priority for the City of Richmond. At every stage of the development of our final Smart Cities Challenge proposal, we have engaged with residents, a wide range of stakeholders from the business, technology and academic sectors and with other levels of government. This engagement has provided the opportunity to develop innovative, collaborative approaches to connect with a diverse audience and has guided the direction of our final submission. Our ongoing engagement plan incorporates a range of communication channels to ensure continued alignment with our community's needs and our project outcomes.

7. DATA AND PRIVACY

We are fully committed to protecting the privacy of our residents and are aware of the many complex challenges cities across Canada face in this regard. We are confident in the security by design and safeguards we are putting in place. We will make data security and privacy the first priority in design of all components of our Smart Cities projects and fully test and confirm our data environment, flows and security. We adhere to the Personal Information Protection and Electronic Documents Act ("PIPEDA") and the British Columbia's Freedom of Information and Protection of Privacy Act.

8. FINANCIAL

We have developed a plan and will deliver our project on time and on budget. Our Smart Cities projects represent a total capital investment of $62,336,649 with $10,200,000 already committed in the City's existing Five Year Financial Plan. Through our partner network we have been able to identify and secure commitments for supplementary contributions of significant value of over $10,291,000. This includes a $5,400,000 economy-energizing investment from public and private partners that MDA Corporation is spearheading to be submitted to the Government of Canada's Innovation Superclusters Initiative.

9. IMPLEMENTATION PHASE REQUIREMENTS

From day one, our implementation plans have been guided by requirements and commitments to our residents and other stakeholders. This includes our commitments to meet applicable municipal, provincial, and federal legislative and policy requirements.

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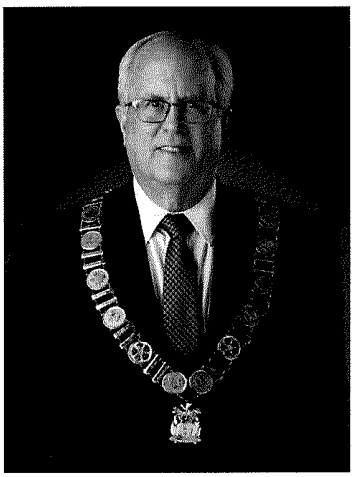

"Richmond City Council is unanimously behind the Smart Cities Challenge Proposal. With eight of the world's top 100 technology companies based right here in Richmond BC, we are already well on our way to becoming a model Smart City."

- Mayor Malcolm Brodie, City of Richmond

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VISION

Our proposal is designed to achieve our vision statement: "Together with our community, government, academic and technology team, we will identify and mitigate risk and improve the day-to-day quality of life for residents and businesses on our island."

Our Smart Cities vision will protect our island city, increase operational efficiency, enhance the day-to-day quality of life for people who live, work, study and play in Richmond, and enhance community resilience to emergency situations of any magnitude.

Community benefits of our Smart Cities vision will include:

- Real-time incident notifications and faster response times by emergency crews;
- Safer streets with reduction of traffic incidents, congestion and commute times;
- Greater community resiliency for 72 hours post-disaster;
- Early incident detection of flooding, earthquakes and spills;
- Improved communication with our residents;
- Improved way-finding for residents and visitors; and
- Expanded on-demand e-services to City residents and businesses.

Our Challenge Statement

"Richmond, an island city with a rapidly growing and diverse population and home of nationally significant infrastructure and government services, requires resilient physical and virtual platforms that are integrated seamlessly across all levels of government to enhance quality of life in day-to-day activities and minimize community impacts from major disasters."

1.1 OUR CITY

Richmond is an island city located on Canada's west coast. Comprised of 17 islands, and situated in the mouth of the Fraser River, we are a crossroads of trade and culture and are at the centre of the ecologically important Fraser River Estuary. Richmond is truly a gateway to the Asia Pacific. The city is home to Vancouver International Airport and over 74% of the city's population originates from Asia Pacific countries.

Seventeen minutes from Downtown Vancouver via the Canada Line rapid transit, Richmond is also only 30 minutes from the US border via Highway 99. Vancouver International Airport linked 25.9 million passengers to the rest of Canada, and the world in 2018. Richmond's population, currently 225,000, has experienced rapid growth and is expected to reach 280,000 by 2041. A major employment centre in Metro Vancouver, Richmond provides 1.44 local jobs for every 1 resident worker. At present, approximately 140,000 people are employed in Richmond, giving the City the highest job-to-labour force ratio in the region. Large employment generators include the Vancouver International Airport and the Port of Vancouver. Our transportation infrastructure is of critical importance to our local, regional and national economies.

While our operations are already a best practice in flood mitigation and emergency response, the Smart Cities five year plan will use technology to better manage everyday incidents, mitigate impacts of climate change and to identify and mitigate risk from emergencies.

Richmond has a reputation for excellence, a corporate culture built on innovation, and a track record of honouring the commitments we make, like delivering the premier venue and legacy facility of the 2010 Olympic Games: the Richmond Olympic Oval. Our commitment to continuous improvement is reflected in our Smart Cities proposal.

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1.2 OUR SMART CITIES INITIATIVE

Our proposal can be simply expressed through a four-word alliterative process: Collect, Connect, Crunch, Communicate.

Data will be collected from a comprehensive array of City and partner sensors across the city and shared through integrated communication networks.

Through physical and virtual participation in an Intelligent Operations Hub, the City and partner agencies will quickly analyze collected information and use it to make timely and effective decisions that guide day-to-day service delivery and response to emergencies

A comprehensive digital delivery network coordinated from the Hub will power an ever expanding suite of on-demand e-services for residents and business. Emergency notifications and general community information in multiple languages will be delivered directly to the public wherever they are via their home computers or smart devices and digital information screens throughout the public domain.

Collect

Data is collected from City systems, smart sensors and cameras, business applications, external systems and partner organizations.

Connect

Data from these multiple sources is transmitted to be processed through sensor networks, LTE and fibre optics to the Intelligent Operations Hub.

Crunch

Data is integrated and processed into useful, consumable information available to the City and our partners, supporting integrated operations both physically and virtually.

Communicate

Information is communicated to consumers through integrated digital platforms and mobile applications.

Key components of Richmond's Smart Cities process — collect, connect, crunch, communicate.

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1.2.1 SMART CITIES COMMITMENTS

The Smart Cities Challenge is an opportunity for municipalities to form new partnerships to resolve important issues by using data and connected technology to achieve community benefit.

Our proposal answers the call to create transparent, adaptable plans that can be replicated across Canada to achieve meaningful outcomes and transform cities.

It supports the use of an new outcomes-based technologically agnostic approach to address the challenge statement.

The outcomes will enhance the day-to-day lives of residents and businesses and minimize community impacts from major disasters.

This project will support the development of integrated emergency plans which will identify shared data and define clear roles for partners.

1.3 GUIDING PRINCIPLES

DIMENSION	SUMMARY DESCRIPTION
1. Leadership / Governance	Strong leadership with a commitment to implementing best practice and strategically managing the Smart Cities projects to establish a transformational mindset and deliver against resident priorities and project outcomes.
2. Openness	The City is committed to the openness and usability of data collected and processed through our Smart Cities proposal. Non-personal data will be made available, both to our partners and to the public, using an industry standard, Open APIs. This will encourage further innovation and analysis by enabling the creation of new applications and research that references published data.
3. Integration	Deploy assets that are linked to City services and integrated to City-wide information technology (IT) architecture. A commitment to open standards, the dismantling of silos, integration of Internet of Things (IoT) and other technologies, and the integration with external advisors.
4. Transferability	Tools, systems and processes should be transparent and standardized. Promote the use of open-source technology and commit to sharing tools, systems and learnings with other communities and advisors.
5. Collaboration	Collaborate with third parties and the academic, government and business community to meet resident and stakeholder needs. Engage regularly with the residents to inform activities, strengthen communities and promote social equity.
6. Data Privacy	Build out architecture to specifically ensure that we have close control over use of personal information and privacy. Ability to select how much personal information to collect, save and process, and which information to share with advisors and which to share publicly.

Richmond is committed to sharing our knowledge from our Smart Cities Challenge journey with other Canadian cities. As such, we have included additional templates and resources in various appendices to transfer what we have learned through this process.

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1.4 OUR OUTCOMES: AN EVOLUTION

In our initial submission, we communicated the key activities contributing to each of our outcomes. Since then, we have further established the Governance and Project Structure around these activities, implemented cross-functional project teams and fully developed our implementation plan.

From our Challenge Statement, our Smart City project outcomes have evolved. As part of our process, the City engaged local residents, businesses, and technology companies for advice and consultation (refer to Chapter 6: Engagement for more details on the workshops and community consultations undertaken). During the course of our Smart Cities Advisory Workshops, we have simplified our project's outcomes to:

- Protect our Island City
- Enable More Informed Decision-Making
- Integrate Communications and Enhance Community Resilience

Table 1.4 Connection and Transformation of Our Project Outcomes

CHALLENGE STATEMENT	ORIGINAL OUTCOMES	REVISED OUTCOMES	REASON FOR CHANGE
Resilient physical/ virtual platforms **Seamless integration across all forms of government** **Minimize community impacts of major disasters**	Protect our Island City Create mobility systems that enhance daily life and are scalable to improve emergency response rates and recovery times	Protect our Island City	The rationale for this outcome remains the same. As a city surrounded by ocean and river, the City of Richmond is vulnerable to flooding and isolation during an emergency. In the Flood Protection Strategy, the City has identified risks, mitigation goals, and objectives/strategies required to make more informed planning decisions for citizens and businesses that call Richmond home. Infrastructure will be installed to mitigate the effects of climate change and decrease environmental impacts. Richmond has an Emergency Plan and works diligently to prepare for emergency response. As demand grows, the need for service also increases. Technology serves to improve decision-making for Richmond, key stakeholders and government organizations and allow for more effective response coordination.
Enhance quality of life in the day to day	Create mobility systems that enhance daily life and are scalable to improve emergency response rates and recovery times	Enable More Informed Decision-Making	The rationale has expanded beyond transportation into all forms of data that we will Collect, Connect, Crunch, and Communicate; please see Chapters 4 and 6 for more details. New infrastructure and equipment will be enabled with enhanced decision-making functionality. The technology we are putting in place will allow us to collect raw data sets from multiple sources. We will connect this data to an Intelligent Operations Hub capable of crunching and processing that data to provide real time situational awareness, predictive capabilities and historical data analysis. We will be able to communicate this valuable information in near real time to City departments, partners and residents. We have partnered with a number of leading technology companies to deliver resilient, scalable and transferable technology to support our outcomes. Based on our Smart Cities Advisory Workshops, we have revised this project outcome.

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Table 1.4 Connection and Transformation of Our Project Outcomes

CHALLENGE STATEMENT	ORIGINAL OUTCOMES	REVISED OUTCOMES	REASON FOR CHANGE
Diverse Populations	Bridge Language Barriers	Integrate Communications and Enhance Community Resilience	The rationale for this outcome remains the same. Over 74% of the population of Richmond is from Asia Pacific countries. Nearly two thirds of Richmond residents identify English or French as their second language. With 54% of the population speaking a language other than English most often at home, staff need to be able to seamlessly communicate with residents and businesses, both in day to day operations and in emergency evacuation situations. Staff currently use computer applications to interpret when communication is difficult, due to language, but a comprehensive strategy is required. It is not always possible to have staff available to translate directions or facilitate feedback. Technology will enable enhanced real time on-demand communication with residents regardless of language barriers.
Seamless integration across all forms of government	Integrate Citizen, Infrastructure and Emergency Data and Communication Platform	Integrate Communications and Enhance Community Resilience	The rationale for this outcome remains the same. Currently, each level of government and stakeholder has their own emergency response protocols and warning systems. While a significant amount of data is collected by business units within the City and by stakeholders, there is tremendous opportunity to connect and share the information generated by these disparate data sources for analysis and more informed decision-making. Based on feedback from our Smart Cities Advisory Workshops, we have revised our project outcome.

1.5 OUR PROJECTS AND TEST CASES/PROOF OF CONCEPTS

Our Smart Cities projects are forward thinking and ambitious, comprised of multiple projects across numerous City departments and with external partners. Projects have been identified by listening to the needs of our community, staff and stakeholders. Our plans have been developed with cross-functional teams of City staff and stakeholders working together to prioritize actions and projects that will most effectively deliver on our outcomes. A detailed summary of our Project Management approach can be found in Chapter 3.

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Table 1.5 Projects, Test Cases and Proof of Concepts

1.1 Create Smart Streets through connected sensors and decrease the number of traffic collisions:
This includes the installation of infrastructure to support smart street lights and smart cameras at high risk intersections and installation of a GPS-based emergency pre-emption system at signalized intersections.

1.1.1 TELUS PureFibre Test case in Richmond

1.2 Create Sustainable Transportation through transition to electric modes of transportation:
This includes the installation of infrastructure to accommodate all vehicle types, and the creation of Mobility Hubs.

2.1 Create Integrated Smart Sensors that support infrastructure management and Post Disaster Assessment:
This includes increased situational awareness through the installation of utility based, air quality and seismic sensors, and drone technology; as well as information from our partners.

2.2 Install resilient power to function for 72 hours post disaster for key assets:
This includes equipping all vital infrastructure with emergency power for 72 hours, including the Integrated Intelligent Operations Hub, Emergency Operation Centre(s), Emergency Reception Centres and way-finding infrastructure.

2.3 Create an Integrated Intelligent Operations Hub (physical and virtual):
This includes creating an integrated everyday operation centre to manage City operations that can seamlessly transition into emergency response as well as developing a virtual platform to allow partners to share data, information and insights in real or near real time and decisions to be made offsite when required. The Hub will coordinate all early warning notifications.

2.3.1 Intelligent Field Operations Test Case – Provincial Emergency Management Technology Cluster

2.3.2 Predictive models to identify risk of flooding, liquefaction, earthquakes and toxic spills in the Fraser River — Innovative Superclusters Initiative led by MDA

2.3.3 Integrated Emergency Plan Development between three levels of government for flooding, earthquakes and toxic spills.

2.3.4 Traffic Predictive Analytics Proof of Concept by TIBCO

3.1 Implement MyRichmond:
Enhancements to the MyRichmond customizable web platform and planned mobile application will enable residents and businesses to access a variety of City services and emergency planning resources using a single identity and password.

3.2 Integrated Communication Tools:
This includes development of a communications network and processes that allow emergency notifications and other public information (from multiple organizations) to be seamlessly and simultaneously delivered to the public from a single source through multiple channels, as well as integration of automated translation tools on City information platforms.

3.2.1 Google Translate and Amazon Translate Test Case

3.3 Develop way-finding solutions for everyday and emergency use:
This includes the development of a way-finding strategy that incorporates digital screens and message boards within the public domain to deliver day-to-day information, as well as real-time emergency notifications.

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1.6 OUR JOURNEY TO INTEGRATED OPERATIONS AND COMMUNICATIONS

"Our experience with a major bog fire in the summer of 2018 illustrates how enhanced situational awareness can enable more informed decision-making and increase the efficiency of emergency response."

- Chief Tim Wilkinson, Richmond Fire-Rescue

For a Case Study supporting our proposed integrated approach to operations and communications, refer to Appendix 1.1.

1.6.1 INTEGRATED SMART CITIES TEAM

Richmond is a unique and high performing City, familiar with stepping up to meet challenges like delivering the Richmond Olympic Oval when our government partners needed our support, on very tight timelines. The Smart Cities Challenge has provided the same opportunity to create integrated cross-divisional teams across our organization to bring the best thinking to the forefront. The outcomes-based lens we have applied via the Smart Cities Challenge solidified our one team approach and helped us form a strong base for the project. We trust each other and are willing to constantly challenge the boundaries to explore alternative ways to develop innovative solutions to complex problems.

Since being selected as a finalist, the City has formed cross-disciplinary project teams to work together towards a single, inclusive Smart City solution. From this integrated base, our collaborative approach has emerged.

Our Smart Cities Project Office is comprised of members from all City divisions working collectively to achieve our outcomes:

Office of the Chief Administrative Officer (CAO)

Functions include Intergovernmental Relations and Corporate Communications and Marketing, as well as strategic and corporate planning.

Finance and Corporate Services

Functions include Information Technology, Law, City Clerks, Finance and Economic Development.

Engineering and Public Works

Functions include engineering design, construction and maintenance services for the City's infrastructure and all City-owned buildings; sewer and drainage; dikes and irrigation systems; and responsibility for environmental services and corporate sustainability.

Community Services

Functions include the provision of parks, recreation, arts and cultural opportunities, activities and facilities; and working with other agencies to develop networks, programs and processes that promote social interaction and cultural enrichment, protect our vulnerable citizens and respect social diversity.

Planning and Development

Functions include delivery of services affecting the physical form of the city, establishing planning and design policies that shape the transportation system of the city and preparing long range land use, urban design and environmental policies.

Community Safety

Brings together the City's public safety providers including Fire-Rescue, RCMP, Emergency Programs and Community Bylaws.

This aggregated approach that was driven by the Smart Cities Challenge is transformational and can be easily adopted by other municipalities across Canada. This approach has led to the development of a data sharing plan across all departments.

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1.6.2 INTEGRATED MUNICIPAL OPERATIONS

The City will move toward an integrated operations approach that will enable enhanced situational awareness provided through a connected network of sensors and communications infrastructure.

Building on existing technology systems, a common virtual platform will seamlessly integrate the City's Operations -based departments and all levels of governments to support early identification of risk, rapid response to incidents and improved post disaster recovery. Enhanced situational awareness will also provide improved decision-making in the delivery of day-to-day City services, including traffic management and environmental programs. For more information on governance and data sharing agreements with stakeholders and advisors, refer to Chapter 5.

Chart 1.6.2 Proposed Data to be Shared Across the City and with Partners

PROPOSED SHARED DATA

Transportation

- Intersection data
- Ministry of Transportation bridges and tunnel
- Port of Vancouver
- EMBC data
- Pre-emptive signals
- Mobility Hub—TransLink
- Charging Plan—TransLink
- Smart Street sensors/cameras
- ICBC crash data
- Bus routes and vehicle location tracking—TransLink
- Road closure & re-routing

Communications/IT

- Integrated Partner Communication
- Public/ Local Communication
- Internal Communications
- Way-Finding
- Media Outreach
- MyRichmond
- Resource dashboard
- Business Emergency Plans
- Social Media
- IT Dispatch Corporate

Engineering & Public Works

- Flood Mitigation Monitoring/notification
- Click and Fix/call centre and public reporting
- Public City Assets
- District Energy Monitoring
- Building Energy Outputs
- Vehicles and Fleet location
- SCADA data
- IPS Service requests
- Fleet Complete
- Power inputs for major assets
- Recycling Centre

Emergency Programs

- Early Warning System- Ocean Network Sciences- Shake Technology- Liquefaction
- Intermedix EMIS
- Evacuation Plans—All
- Plans for Government Assets
- Coordinated Emergency plans across all levels of Government
- Business Emergency Plans
- Resource Database
- GIS Inventory
- Crisis Communication
- Richmond Chamber of Commerce business continuity
- BC Housing
- Animal care facilities

Richmond Fire Rescue/First Responders

- Emergency response
- E-Comm–E2 E2MV
- Vancouver International Airport Authority (VAA)
- Vancouver Coastal Health
- YVR/ Port of Vancouver Jet Fuel Facility
- Government Assets including schools
- Transport Canada Railway System
- EMBC Data
- Building Plans
- BC Ambulance—ECU
- Coast Guard
- RCMP
- DND

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1.6.3 INTEGRATION AND COLLABORATION WITH OUR ADVISORS

We recognized early on that to be successful in delivering our Challenge Statement, we would need to forge new partnerships in order to enable new ways of working together. When we put the call out for advisors for this project, the response was overwhelming. Our advisory network is comprised of more than 25 public and private sector partners, including government agencies, educational institutions, emergency response services, transportation authorities, telecom companies, and technology providers, all of whom understand the importance of the work we are undertaking and are committed to our shared vision.

Our advisors have been instrumental in crafting our challenge statement, defining the scope of our projects and supporting us in developing our Project Implementation Plans. They will continue to be key to the development and implementation of our Smart Cities solutions and pivotal to the overall success of our vision. The communication between agencies and companies has created true legacy and immense learning between all involved. Discussions between advisors has created new joint projects such as the implementation of the first ever electric charging stations for trucks through collaboration between the Vancouver Fraser Port Authority and TransLink (for more information refer to Appendix 1.2).

Chart 1.6.3 Richmond Smart Cities Challenge Advisory Network

Ameresco | Aware360 | BC Hydro | BCIT Aerospace | Corix | E-Comm 9-1-1 | Government of Canada | IBM
Kwantlen Polytechnic University | Lightship | MDA Corporation | Musqueam Indian Band | Ocean Network's Canada
Province of BC - Emergency Management BC | Richmond School District No. 38 | Royal Canadian Mounted Police (RCMP)
Sierra Wireless | SNC Lavalin | TELUS | TIBCO | TransLink | Transoft Solutions | University of Victoria | UrbanLogiq
Vancouver Fraser Port Authority | Vancouver International Airport Authority (YVR) | Westcoast Sightseeing

Members of our advisory team are not only contributing to the development of our projects, but they are also supporting a number of pilot projects, strategically aligning their own internal initiatives to support our projects and providing data that will be fed into the Intelligent Operations Hub (refer to Chapter 5).

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1.7 PREPARING THE GROUNDWORK TO BE A SMART CITY

From the onset of the Smart Cities Challenge we have pushed ourselves to think differently to solve big problems. Our challenge statement is ambitious and the scopes of our projects reflect this. To date we have worked to lay the foundation for a successful implementation and have made significant progress towards realizing our outcomes.

Table 1.7 Key Milestones in Finalist Phase

Generated detailed Project Implementation Plans for each of our Smart Cities Projects that are realistic, achievable and based on leading practice.	✔
Identified and created an inventory of integrated data sources within the City and across our inter-governmental partners to support integrated operations.	✔
Implemented a robust Governance Structure and related processes, including a Smart Cities Project Office ("Project Office") comprised of senior leaders from across the City.	✔
Mobilized cross-functional Project Teams to develop our Project Implementation Plans, work with our advisors and mobilize support throughout the organization.	✔
Established a Project Advisory Committee made up of government, technology and academic partners who provide expertise, perspective and guidance and are fully aligned with our vision.	✔
Engaged extensively with our community to inform our project plans and gain the full support of our residents, business community and other levels of government.	✔
Fostered authentic commitment to our projects from across City departments, with stakeholders and with the public, to ensure we have the necessary support to make our vision a reality.	✔
Applied a security-by-design approach that considers the privacy of personal data – explicitly designing our data flows to exclude the collection and transfer of personal data.	✔
Ensured alignment of our projects to the City's existing strategies and built off past successes like our award-winning Digital Strategy.	✔
Completed or initiated four technology pilots to provide information and learnings to support the implementation of our projects.	✔
Conducted a preliminary privacy impact assessment (PPIA) across all projects and engaged with partner organizations and the Provincial Privacy Commissioner to ensure protection of personal data and the security of City systems.	✔
Formalized our commitment to Openness and Transferability by developing a website that showcases an honest account and reflection of our Smart Cities journey for other communities to learn from.	✔
Challenged ourselves to think differently in how we interact with the private sector – seeking input on our Smart Cities initiatives and how to optimize engagement and maximize the return on Smart Cities principles of Openness, Integration, Transferability and Collaboration.	✔
Completed an inventory of existing data and sensors across the City of Richmond and our partner network.	✔

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1.8 OUR IMPACT

The City of Richmond is proud to have been selected as a finalist in Canada's Smart Cities Challenge.

Our Final Proposal is transformative and ground breaking. It will make Richmond a more dynamic, informed and resilient community. A city where everything is connected: governments, businesses and people. It will be a new Smart Cities model that is transferable and replicable for local governments across Canada.

Our operations are already a best practice in areas such as flood mitigation and emergency response. Through the Smart Cities Challenge process, joint opportunities have been created with private sector innovators (such as IBM, Lightship, MDA, TELUS, TIBCO and UrbanLogiq) to develop a five year plan to use data and technology to better manage everyday incidents and to more effectively and efficiently identify and mitigate risk from emergencies.

The Challenge has been a catalyst for positive change, impacting internal operations and sparking collaboration with external partners. Beyond setting the foundation for emergency response between all levels of government – a first in Canada – our outcomes-based approach adopted via the Challenge, has enabled us to focus on our local community needs while bringing private sector innovation and investment to achieve our solutions; our outcomes have become the lens that guide our private sector partners and solve our local problems. Our Smart Cities implementations build on our current five year capital plans, and are fully achievable.

Our Smart Cities projects will enhance the lives of our residents and result in the creation of a(n):

Multi Partner Sensor Network – a network of smart infrastructure that collects, connects, and centralizes raw data across asset types and partners. Establishing a valuable asset in the form of big data, to be mined and shared across our partners.

Intelligent Operations Hub – enabling the sharing of real time and historical data, information, insights and notifications between partners and establishing the foundation for a West Coast disaster mitigation Hub.

Machine Learning Enabled Predictive Models – enabling real time situational awareness, actionable insights and automated responses related to emergency mitigation/response and traffic management.

Comprehensive Digital Communication Network – providing a suite of on-demand, multilingual e-services and information resources for residents and businesses via the MyRichmond online platform and a connected network of public domain physical assets.

Technician monitoring traffic conditions on multiple display screens.

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PERFORMANCE MEASUREMENT

Richmond is already a best practice in flood mitigation, sustainability and emergency response. Our Smart Cities projects were specifically designed to achieve identified outcomes to take our City and the integrated work of our partners, to a higher level of functioning, setting a new standard for municipal governments across Canada. We will measure our success through qualitative and quantitative indicators to ensure we are on track and continue to improve the quality of life for residents and businesses in Richmond.

2.1 OUR PROJECTS

Our projects will bring measurable benefits to our residents, including: improved coordination of emergency response, safer streets with reduction of traffic collisions and congestion, greater community resiliency for 72 hours post-disaster, early incident detection and integrated mitigation of flooding, earthquakes and toxic spills in the Fraser River and improved communication with our residents.

For a full list of our projects, refer to Appendix 2.1.

Richmond Fire-Rescue personnel reviewing real time situational awareness map.

2.2 OUR APPROACH

To ensure there is a shared focus and consensus on the value of the projects and their contribution to our outcomes, we have held several alignment workshops internally, with our external partners and the business community.

We will continually assess the strategic and financial value of the planned projects and ensure they remain aligned with the City of Richmond's, Provincial and Federal strategic priorities and our Smart Cities vision. This process is detailed in the project monitoring and reporting section on the following page.

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Table 2.2 Our Approach

Alignment	City: Official Community Plan 2041; Emergency Plan; Digital Strategy; Sustainability Framework; Flood Mitigation Strategy Update; Community Energy Emissions Plan; Community Wellness Strategy; Fire-Rescue Plan 2016-2018; Social Development Strategy; Sustainability Progress Report – 2014; Community Energy & Emissions Plan; Five Year Financial Plan Government of BC: Flood Management Strategy; Sustainability Strategy; Jobs Strategy; Innovation Strategy; Economic Development Strategy; Emergency Management Strategy; Advanced Education Plan; CleanBC Government of Canada: Innovation Strategy; Sustainability Strategy; Jobs Strategy; Pan-Canadian Framework on Clean Growth and Climate Change
Local Need	Official Community Plan (OCP) Chapter 5.0 Safe City OBJECTIVE 5: Ensure the City's emergency plans are current and appropriate. OBJECTIVE 6: Ensure that the public safety agencies serving Richmond have a common communication and dispatch system that enables direct inter-agency communication and coordination. Chapter 8.0 Mobility and Access Chapter 12.0 Sustainable Infrastructure and Resources Community consultation and feedback
Challenge Statement	Resilient physical/virtual platforms Seamless integration across all forms of government Minimize community impacts of major disasters Enhance quality of life in the day-to-day Meet the needs of a growing and diverse population
Outcomes	Protect our Island City Enable More Informed Decision-Making Integrate Communications and Enhance Community Resilience
Activities	Project Teams 1.1 Smart Streets 1.2 Sustainable Transportation 2.1 Integrated Smart Sensors that Support Infrastructure Management and Post Disaster Assessment 2.2 Resilient Energy Source for Emergency Assets 2.3 Intelligent Operations Hub 3.1 MyRichmond 3.2 Integrated Communication Tools 3.3 Smart Way-Finding Solutions Proof of Concepts and Test Cases
Performance Indicators	Assign performance indicators for each outcome (immediate, intermediate and long term).
Measure Performance	Identify data sources and system that will be used to measure performance Define frequency and responsibility of data collection Establish baselines, targets and timeline

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2.3 LOGIC MODELS

We have created logic models that serve as a road-map for our projects and are a visual expression of the rationale behind our Smart Cities initiative to achieve our community outcomes. Each model outlines the activities that will be undertaken and the intended outcomes/results.

Chart 2.3 Logic Model: Projects 1.1 and 1.2 Smart Streets Technology

PROJECTS

Activities	Immediate Outcomes	Intermediate Outcomes	Long-Term Outcomes
Smart Streets • Install smart street lights on roadways with LED lighting, high definition motion sensors, sound sensors, and Wi-Fi; • Install fibre optics and deploy smart cameras at high risk signalized intersections; • Install a GPS Based Emergency Pre-emption System at signalized intersections; • Install additional features in the Advanced Traffic Management System (ATMS); • Install of Uninterruptible Battery Backup System (UPS) at all signalized intersections; and • Enable data flow from smart street infrastructure locations to Intelligent Operations Hub.	• Smart Street Lights are installed • Fibre optics and smart cameras are installed at major intersections • GPS based Emergency Pre-Emption installed at major intersections • Advanced Traffic Management System is updated • Uninterruptible Battery System is installed at signalized intersections • Data from smart street infrastructure connected to Intelligent Operations Hub.	• Reduction in energy consumption • Reduction in maintenance costs • Increased public safety through better street lighting • Decreased rate of traffic incidents • Improved traffic management • Improved efficiency of emergency response • Reduction in power outage hours at intersections • Increased connectivity and integration between systems • Increased preparedness for future technology • Increased uptake of sustainable transportation	Protect Our Island City Enable More Informed Decision-Making
Sustainable Transportation • Increase infrastructure required to charge electric vehicles including buses and quick charge for buses; • Install technology for all road users including transit priority, future deployment of autonomous vehicles and e-bike charging stations; • Coordinate City resources and partners to develop Mobility Hub networks at strategic locations to support interregional transportation, emergency response, and priority charging stations at the airport, hospital, police station and fire halls; • Develop software to link assets to Intelligent Operations Hub; and • Create applications to identify key assets including electric vehicle charging stations.	• Electric Vehicle charging infrastructure installed • Multi-modal Mobility Hubs created • Sustainable Transportation assets are linked to Intelligent Operations Hub		

INDICATORS

• # of smart street lights installed • # of smart cameras installed at major intersections • # intersections connected to fibre optics • # of GPS based Emergency Pre-Emption installed at major intersections • # Uninterruptible Battery System installed at signalized intersections • % of data connected to Hub • % completion of Advanced Traffic Management System update	• % reduction in energy consumption • % reduction in maintenance costs related to street lighting • % reduction in traffic incidents at major intersections • % reduction in congestion around major intersections • Level of satisfaction with the amount of congestion • % reduction in GHG from decreased idling of cars • % improvement of emergency response times at major intersections • Increased level of satisfaction with emergency response • % reduction in power outage hours at major intersections • % increase in resident ownership of EVs over baseline • % uptake of sustainable transportation	• Improvement in quality of life of citizens • Increased safety of citizens • Decreased time spent in traffic by citizens • Level of satisfaction with emergency response • Increased transportation choice for citizens
• # of Electric Vehicle charging infrastructure installed • # of Mobility Hubs created • # electrified bus loops • # fast charging stations for trucks • % of sustainable transportation assets linked to Hub • # secure bike parking facilities		

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Chart 2.3.1 Logic Model: Projects 2.1, 2.2 and 2.3 Disaster Mitigation Technology

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Chart 2.3.2 Logic Model: Projects 3.1, 3.2 and 3.3 Integrated and Connected Communities

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We will continue to build logic models for each of our projects. The following example illustrates the flow of the implementation of the test cases led by MDA and the integrated project team.

Table 2.3.3 Innovative Superclusters Initiative Logic Model

DELIVERS ON					
City • OCP • Sustainability Framework • Flood Mitigation Strategy		**Government of BC** • Flood Management Strategy • Sustainability Strategy • Jobs Strategy • Innovation Strategy • Economic Development Strategy • Emergency Management Strategy • Advanced Education Plan		**Government of Canada** • Innovation Strategy • Sustainability Strategy • Jobs Strategy	
OUTCOMES					
Save $	Better informed decision making	Increase flood mitigation/ protection	Increase/leverage partners	Increase public safety	Improve environment
WHO BENEFITS					
City Operations	Everyone	City	Over 225,000 residents & 14,000 businesses	Local habitats & Climate change	
GOAL					
Reduce City operating and capital costs annually	Increase flood mitigation and awareness Reduce traffic incidents due to inclement weather	Increase the number of grants and investments to the City	Increase the number of residents in businesses that feel safe from flood on traffic incidents caused by weather/rainfall	Protect local habitats from contamination via sensor awareness Use sensor data and consolidated planning to improve local roads to reduce GHG emissions	
METRIC					

% reduction in capital costs through better planning
% reduction in capital costs through better planning
	% Improvement efficiencies in processes	% Increase flood mitigation and awareness
		% Reduction in traffic incidents due to inclement weather
			$ of grants
			$ of investment pilot
			$ of investment ongoing (ie Insurance Co.'s)
				# of people, businesses and homes protected
				% reduction in number of community safety concerns
					% reduction in GHG
					Maintain sensitive habitats

ACTIVITIES					
Consolidate sensor data in usable format Begin joint public works engineering road planning		Work with MDA to develop pilot program that uses City sensors and improved way-finding signage, drones, predictive analytics. Combine with weather/satellite data Coordinate with RCMP to enforce speeding		Work with MDA to apply to the Supercluster initiative Develop data governance model	
PARTNERS					
Private • MDA • Amazon • Local tech companies • Lightship (tbd) • IBM (tbd) • Weather network (tbd) • Insurance Co.'s (tbd)		**Government** • City of Richmond (IGR, Public Works, Engineering) • BC Ministry of Jobs • EMBC • MOTI • BC Hydro • FLNRO • Industry Canada • Environment Canada • Musqueam Indian Band		**Academic** • SFU • KPU • UBC & BCIT (tbd) Other Fraser Basin Council	

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2.4 HOW OUR PROJECTS ALIGN WITH OUR OUTCOMES

Our outcomes were developed and refined in response to community input generated through the finalist phase. The examples below are projects which align with our outcomes and help fulfill community needs.

OUTCOME 1: PROTECT OUR ISLAND CITY

Richmond will continue to address the increasing demands of climate change including extreme weather events, flooding and spills, as it relates to the safety of our island and the change in modes of mobility to decrease greenhouse gas emissions. The work plan and deliverables build on Richmond's ongoing best practice in combatting climate change and below are examples from the work plan.

a. Create an Integrated Intelligent Operations Hub

Richmond will create the first municipal Integrated Intelligent Operations Hub on Canada's West Coast to enhance day-to-day operational efficiency and situational awareness. The model will be replicable in other cities and the City will share its best practices and expertise with other cities across Canada. The recommended location is based on the "post-disaster" certification of the building and its established technology, including connection to the City's fibre optic network (refer to Appendix 2.2 for a design proposal for a physical operations Hub).

The Hub will integrate internal and external partners and virtual members can "plug in" at alternate locations, based on accessibility during an emergency (for example TransLink or YVR Operations Centres) and/or accessed remotely with a secure sign-on. This is especially helpful for key staff living outside the city or when damage or localized flooding prevents the use of the physical location.

b. Install Emergency Power for Key Assets for 72 hours

The City will be prepared to be isolated post-disaster for 72 hours through the provision of emergency power to critical assets, clear way-finding, and improved communication to key stakeholders, businesses and the public.

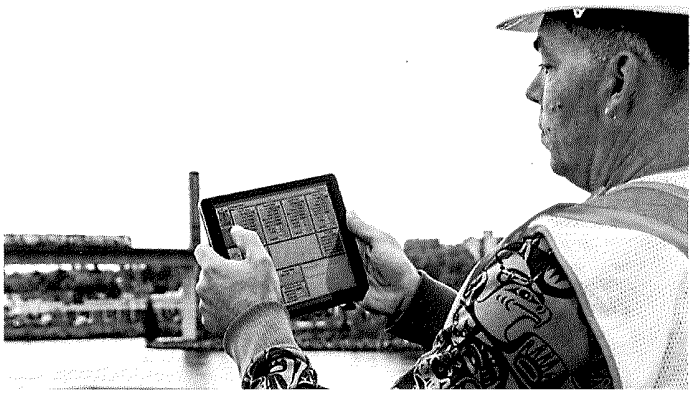
c. Transition to Electric Modes of Transportation

A significant increase in City infrastructure will accommodate the transition to electric vehicles, buses and trucks to significantly decrease greenhouse gas emissions. This includes fast charging infrastructure across the city, located in Mobility Hubs, and the ability to monitor and locate space for charging by the public. Richmond's investments in this area would connect to and supplement commitments by the City's partners including TransLink, who are working on fast charging for buses, and Vancouver Fraser Port Authority, who are working on the first ever fast charging station for trucks.

d. Other Partner Aligned Programs:

1. Early Warning System Notification - Emergency Management BC
2. Prioritized Post-Earthquake Response (PPR) - Emergency Management BC
3. Structural Health Monitoring (SHM) - Ministry of Transportation and Infrastructure ("MOTI")
4. Strong Motion (SM) - Ministry of Transportation and Infrastructure

Technician monitoring sensor data on mobile device.



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OUTCOME 2: ENABLE MORE INFORMED DECISION-MAKING

Information from internal and external sources will be collected, analyzed and shared to make more informed and time-sensitive, operational decisions. Data will be analyzed using machine learning based technology which will identify factors and patterns that create real time predictive models deployed in a neural network. This knowledge will be used to support the development and implementation of integrated response plans which identify the resources and data required both internally and externally to address the identified risks. Key information will also ensure rapid assessment post-disaster to decrease loss of life and return to business as usual for the community.

Innovation Superclusters Initiative Project Team: Test Cases

Richmond will be part of the team that will develop test cases for the projects below. The team will use sensor information already being monitored through the City's Engineering and Public Works division, Ocean Networks Canada, the Ministry of Transportation and Infrastructure and others. New sensors will be added as needed, including sensors required to monitor moisture and leakage in the George Massey Tunnel. The project team will be led by MDA, a Richmond based aerospace technology company. The following will make up the first test cases:

a. Early detection and mitigation of flooding:

Various data sources will be integrated, such as the measurements from drainage pump stations and box culverts, plus information such as water levels on the river, and weather and tide data to indicate high risk times for the city. Rainfall sensor information will be used in analysis and drones will be used for dike inspection. An integrated Emergency Management Plan developed in collaboration with key agencies on the island will identify the resources and data required both internally and from our partners to make the best, most efficient and well-informed decisions (refer to Appendix 5.1). Data can be used to improve ongoing maintenance programs and help identify priority locations for capital infrastructure improvements that will better cope with the more intense and frequent storms that are occurring due to climate change.

"I think what excites me most about the Smart Cities project is that it's an opportunity to use some cutting-edge technology to help make Richmond more resilient, and this can be something that we can showcase and use some of the lessons learned towards other cities in the province."

-Jesal Shah, Director - Disaster Mitigation Branch, Emergency Management BC

b. Early warning for earthquakes and post disaster assessment:

The Ministry of Transportation and Infrastructure has seismic sensors in Richmond that monitor potential ground and building movement. Pre-existing sensors are also secured on all provincial bridges and tunnels. Ocean Networks Canada has early warning earthquake sensors off the east coast of Vancouver Island that are already connected to the Canada Line in Richmond and monitored by TransLink. The City will integrate this information and be the first Canadian municipal government to connect to the early warning system through our proposed Intelligent Operations Hub.

Emergency Management BC and Kwantlen Polytechnic University will test sensors for post disaster assessment after a quake that is over 5.0 magnitude. Sensors will be connected to create better information to improve predictability and implications of seismic events and give the community up to 90 seconds in preparation time for a major earthquake. Part of this test case will be to indicate through water pressure sensors, how to identify decreased leakage from pipes as well as indicate where water is available with suitable pressure to fight fires.

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c. Early detection and mitigation of spills in the riparian zone (e.g. jet fuel):

Sensors placed in and around key risk areas such as at the Port of Vancouver docks; YVR and high traffic waterways, will identify potential fuel leakage or toxic spills and communicate that information to the Intelligent Operations Hub. Pre-programmed drones will be sent out to inspect possible leaks or spills and if confirmed, an integrated response plan will be enacted with predetermined shared information/data identified and clear operational responsibilities established between partners. Satellite images will be used to track spills, similar to work conducted in the Gulf of Mexico, to decrease risk to habitat and protect water resources. This project will be supported by Vancouver Fraser Port Authority and Transport Canada.

d. Improved road safety and reduction of traffic collisions due to weather conditions:

Richmond has sensors that measure traffic volumes and monitor temperature and moisture of the roads. Working with the Ministry of Transportation and Infrastructure, additional sensors will be implemented which will provide enhanced traffic volume data including speed and direction of travel. At least three-quarters of collisions occur during rainfall events and work has been conducted to identify other patterns including the most common times and days of incidents. Analysis will be conducted to introduce variable speed on roadways based on road conditions at high risk intersections and highways.

The City's Emergency Programs volunteers join forces with the Smart Cities Street Team to engage the public.

"I'm excited to see Richmond at the finish line of the final Smart Cities Challenge! I volunteer with Emergency Programs because I believe that being aware, prepared, and ahead of the curve is so crucial for our community. Richmond Emergency Programs is an opportunity to build our city's resilience and connect every resident and visitor alike even as we grow. Through the Program's initiatives to educate the public and fortify the city's ability to respond to emergencies, I've learned that our community is enthusiastic about learning how to prepare themselves. Richmond has a strong foundation to start, and this could be enhanced by greater connection, streamlined communication, innovation, and increased engagement. The Smart Cities Challenge will help Richmond integrate technology, government, information and data, and our citizens to make sure that our city only becomes more resilient and responsive. "

- Xenia Sammi Wong,
Emergency Programs volunteer

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OUTCOME 3: INTEGRATE COMMUNICATIONS AND ENHANCE COMMUNITY RESILIENCE

A significant element of the Smart Cities Challenge is the engagement of residents, stakeholders, businesses and partners to ensure that the community will benefit from the proposed outcomes. The examples below help us achieve our outcome:

a. Expand MyRichmond customized web platform:

Further modules of the award-winning MyRichmond platform will be implemented to improve the customer experience and enhance the suite of e-services. This will include linking MyRichmond to the Intelligent Operations Hub so it can be used as a primary medium for delivering day-to-day and emergency notifications to the public. Further development of the single sign-on MyRichmond platform will ensure our community has stronger online connection to local government and that City operations are aware of the needs of our community. Other additions include adding interactive emergency planning resources for residents and businesses and development of a mobile app that will allow the service to be more easily used on mobile devices.

b. Develop Intelligent Operational Digital Platform of Existing Sensor Performance:

The City is currently working with the Ministry of Jobs, Trades and Technology on a test case with Richmond's existing sensor technology in Engineering and Public Works, Transportation, Fire-Rescue and Emergency Operations. The Province of BC supports the development of a digital platform which visually monitors the performance of an array of sensors. Refer to Appendix 2.3 for a description of Lightship Field Operations Platform. This includes the provincial seismic sensors in the ground and on major assets including the George Massey Tunnel and all the provincially owned bridges. A map and listing of existing sensors monitored by Richmond and the Province is included for information (refer to Appendix 2.4).

"Glad to see a conversation starting on this important issue!"

- Survey response

c. Enhance communication to the public:

An integrated communications network will allow the City to seamlessly deliver personalized and emergency notifications and general information to the public through a variety of City and partner communication channels. This will include use of both online communication channels that will deliver messages to the public via personal computers and smart devices, as well as via digital screens within the public domain. Existing City and partner digital screens across Richmond will be further connected through a comprehensive way-finding program. In addition to helping improve visitor and resident navigation through Richmond, digital screens embedded within way-finding infrastructure (including assets owned by our partners) will provide further opportunities to deliver emergency and other notifications to the public.

d. Develop communication tools to target Richmond's diverse population:

In order to improve communication with our diverse community, several projects are planned:

- Multilingual content will be enhanced on City websites and in other media; staff and the public will have access to a multilingual call centre; and automated translation tools will be made more broadly available to the public and staff.
- A testing plan is being developed using citizen focus groups to evaluate the effectiveness of select automated translation tools on selected pages of the Smart Cities project website smartcity.richmond.ca. This will establish a baseline benchmark for further development and use of these tools to bridge language barriers.
- Kwantlen Polytechnic University will develop a design brief for a suite of communication tools that use universal visual symbols to bridge communication barriers.

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2.5 PERFORMANCE INDICATORS

As identified in the Logic Models, we have developed performance indicators for each outcome and have identified both qualitative and quantitative indicators.

Quantitative measures are derived through existing data sources available to the City and pertain to emergency response, traffic management and sustainability.

Table 2.5 Performance Indicators Emergency Response, Traffic Management and Sustainability

MEASURE	PERFORMANCE INDICATOR	BASELINE	2024 TARGET
Emergency Response	Early warning notification	0 seconds warning for an emergency event 0 connected government agencies	Up to 90 seconds warning for an emergency event 3 levels of government connected
	Signed up for public notifications	32,000 (2018)	200% increase
	Richmond Resilient Communities Program	233 registrants (2018)	300% increase
Traffic Management	Traffic incidences (collisions) at intersections	The Insurance Corporation of British Columbia ("ICBC") crash data 2017	Minimum 40% decrease of collisions at highest risk intersections
Sustainability	Green House Gas emissions from vehicles	977,972 tCO_2e (2015)	30% per capita reduction
	EV Charging Time	31,979 hours (2017)	300% Increase

Table 2.5.1 Baseline and Target Deliverables by Project

ACTIVITIES	PERFORMANCE INDICATOR BASELINE	DELIVERABLES BY 2024
1.1 Smart Streets	• 0 Smart Street lights • 0 Smart cameras	• 12,000 Smart Street lights • Integrate smart traffic cameras in 15 high risk intersections inclusive of smart camera technology • 100 intersections connected to fibre optics
1.2 Sustainable Transportation	• 0 Mobility Hubs • 1 level two charging station • 0 level three charging stations	• Installation of 16 level three charging stations • Installation of 32 level 2 charging stations • 2 Mobility Hubs installed • Installation of 1 electrified main bus-loop and 1 fast charging station for trucks • Install 2 secure bike parking facilities at end of route (i.e., Canada Line stations, community centres – with corresponding app for the public)

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Table 2.5.1 Baseline and Target Deliverables by Project, continued

ACTIVITIES	PERFORMANCE INDICATOR BASELINE	DELIVERABLES BY 2024
2.1 Integrated Smart Alerts and Post Disaster Assessment	• 0 Integrated Sensors (500 Standalone sensors) • 0 Shake sensors installed • 0 drone assessment program • 0 partners connected to early warning system • No database of community assets across levels of government and partners	• Network of 550 disaster mitigation sensors integrated to the Hub • 10 shake sensors implemented and connected to the Hub • 1 Drone assessment program implemented • Online locators and damage sensors installed on electric charging stations
2.2 Resilient Energy Source for Emergency Assets	• Some assets have generator power for 24 hours	Upgrade of approximately 170 assets with smart resilient energy sources and integrated to the Hub: • Water PRV station – turbine generator (installed) 13 locations • Sanitary Pump Stations – Full 'smart upgrade' c/w battery energy system (8 locations) • Sanitary Pump Stations w/ existing generators– full 'smart upgrade' less energy source (3 locations) • Drainage Pump Stations – full 'smart upgrade' c/w generator (7 locations) • Drainage Pump Stations w/ existing generator– full 'smart upgrade' less generator (18 locations) • Buildings (generator install) (9 locations) • Digital sign at bus shelters - battery energy system (approximately 100 locations) • Streetlight backup power (approximately 15 locations) 1 Energy dashboard to monitor assets
2.3 Integrated Intelligent Operations Hub	• Proof-of-concepts demonstrate functionality and value of predictive analytics • No virtual integration across partners • Ad hoc integration of internal City processes and systems	• Integrate a physical operations centre into an existing facility • Full integration of the Intelligent Operations Hub for safety and security and mobility • Integration of EMBC, ONC, Federal Early Warning System and Richmond test cases integrated to the Hub • 5 predictive models to support safety security and mobility • KPU liquefaction analytics for early warning detection • 4 data sharing agreements in place with key stakeholders • Ability to seamlessly share data across multiple platforms • Data Lake repository for historical data • 3 levels of government connected • Creation of User Federated logins and API keys • 10 to 90 seconds gained in warning of catastrophic event in alignment with the Federal Government • Sensor data from EMBC, BC Hydro, TransLink and others

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Table 2.5.1 Baseline and Target Deliverables by Project, continued

ACTIVITIES	PERFORMANCE INDICATOR BASELINE	DELIVERABLES BY 2024
3.1 MyRichmond	• 10,000 household accounts • 0 businesses • 0 mobile applications	• 80,000 household and business accounts • 80% of registered businesses • 1 mobile application
3.2 Integrated Communication Tools	• 0 data sharing agreements in place with key stakeholders • 0 shared communication platform with partners • Disconnected communication across levels of government • Disparate multilingual e-tools	• All digital information is available in multilingual format • Public access to multilingual call centre • Provision of additional smart devices enabled with multilingual translation tools for first responders
3.3 Smart Way-Finding Solutions	• 6 digital transit shelters • 0 digital signage with feeds to the Hub	**Phase 1:** • Enable 6 digital transit shelters with integration to the Hub • Build and integrate 4 additional (Class A) fully digitally enabled transit shelters and 10 fully digitally enabled way-finding kiosks • Supporting network of way-finding and interpretive signage **Phase 2:** • Install 60 additional Class B and C digitally enabled transit shelters and integrate with Hub

Qualitative measures will be evaluated through continued engagement with residents, stakeholders and City partners. Refer to Chapter 6 for details on how this information will be sourced.

Residents engage with staff and advisors at the Smart Cities Ideas Fair at KPU.

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2.6 TIMELINES AND MILESTONES

Our projects will be implemented over the next 5 years from April 2019 to June 2024. As we are aligned with partners and beginning test cases based on our scheduled activities, we expect to see results against our outcomes within the first 8-12 months. We have included detailed program level timelines and milestones (refer to Chapter 3).

2.7 PAYMENT SCHEDULE

We have proposed a payment schedule tied to our progress toward achieving our outcomes. It is in line with the requirements of the Finalist Guide, and is appropriate in the context of project timelines, deliverables, and milestones. For more information on the deliverables in the proposed payment schedule refer to Chapter 8.

2.8 MONITORING, REPORTING AND EVALUATION STRATEGIES

Chapter 3 details the overarching project monitoring and reporting processes to be used to oversee and manage our Smart Cities projects. Processes have been purposefully designed to meet the monitoring and reporting requirements of an outcomes-based contribution agreement between the City of Richmond and Infrastructure Canada. We will work with Infrastructure Canada to ensure our reporting and governance structures meet the requirements of the outcomes-based contribution agreement.

Richmond City Council demonstrated their commitment to our Smart Cities vision.

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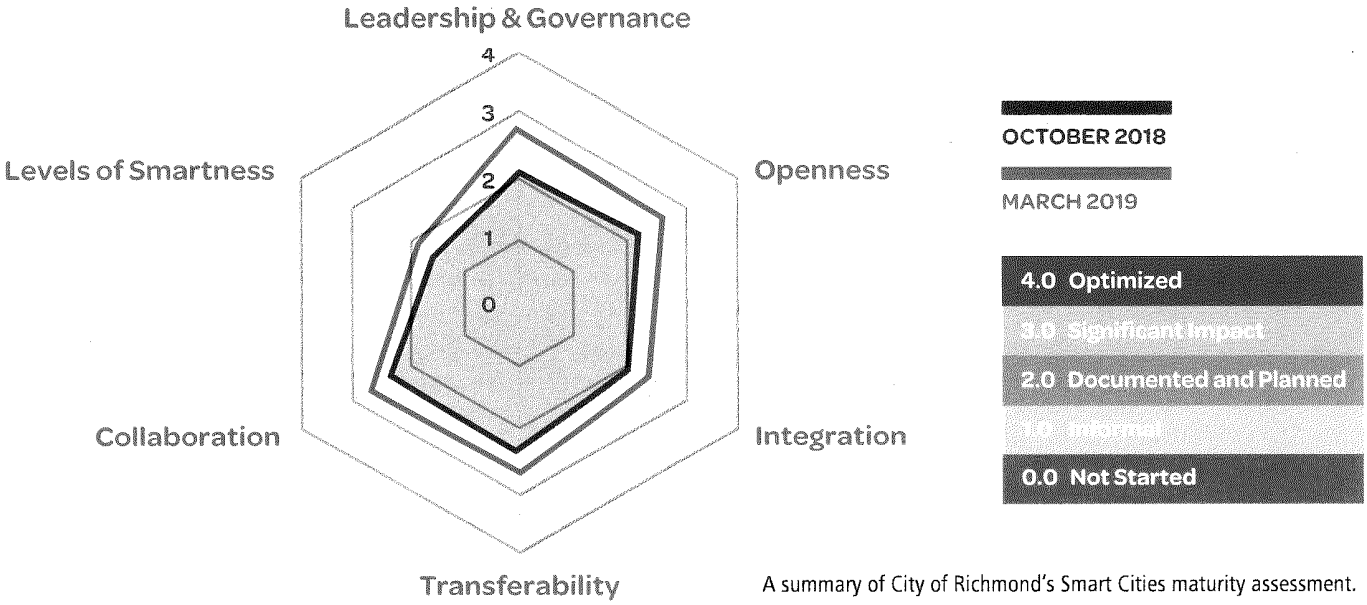
2.8.1 MEASURING PROGRESS

The City undertook an independent assessment in October 2018 to establish a baseline measure of our current state level of maturity against the Smart Cities approach and principles. This has provided us with the ability to track our Smart Cities progress over time. We have already measured significant growth within the City since our initial assessment – a summary is provided below:



A summary of City of Richmond's Smart Cities maturity assessment.

2.9 RISKS AND MITIGATION

Table 2.9 Performance Measurement Risks and Mitigation

RISK	DESCRIPTION	MITIGATION
Outcomes and associated targets misaligned with resident priorities	There is a risk of a mismatch between resident priorities and the outcomes and associated targets.	Communicate project plans, progress, impacts and benefits to community members and stakeholders to ensure they are fully informed about the projects and that the project team members understand their interests and concerns.
Availability of information and data	Data is not available or not current.	Investigate and determine reliable and frequently updated data sources when setting the targets.
Quality of information and data	Data is of poor quality or misleading.	Investigate and determine reliable and good quality data sources when setting the targets. Establishing a clear purpose for the data so that only useful data is collected.
Poor reporting against targets	Reporting against targets is inconsistent and lacking in detail.	Assign a dedicated resource to be responsible for managing the collection of data and reporting against targets.

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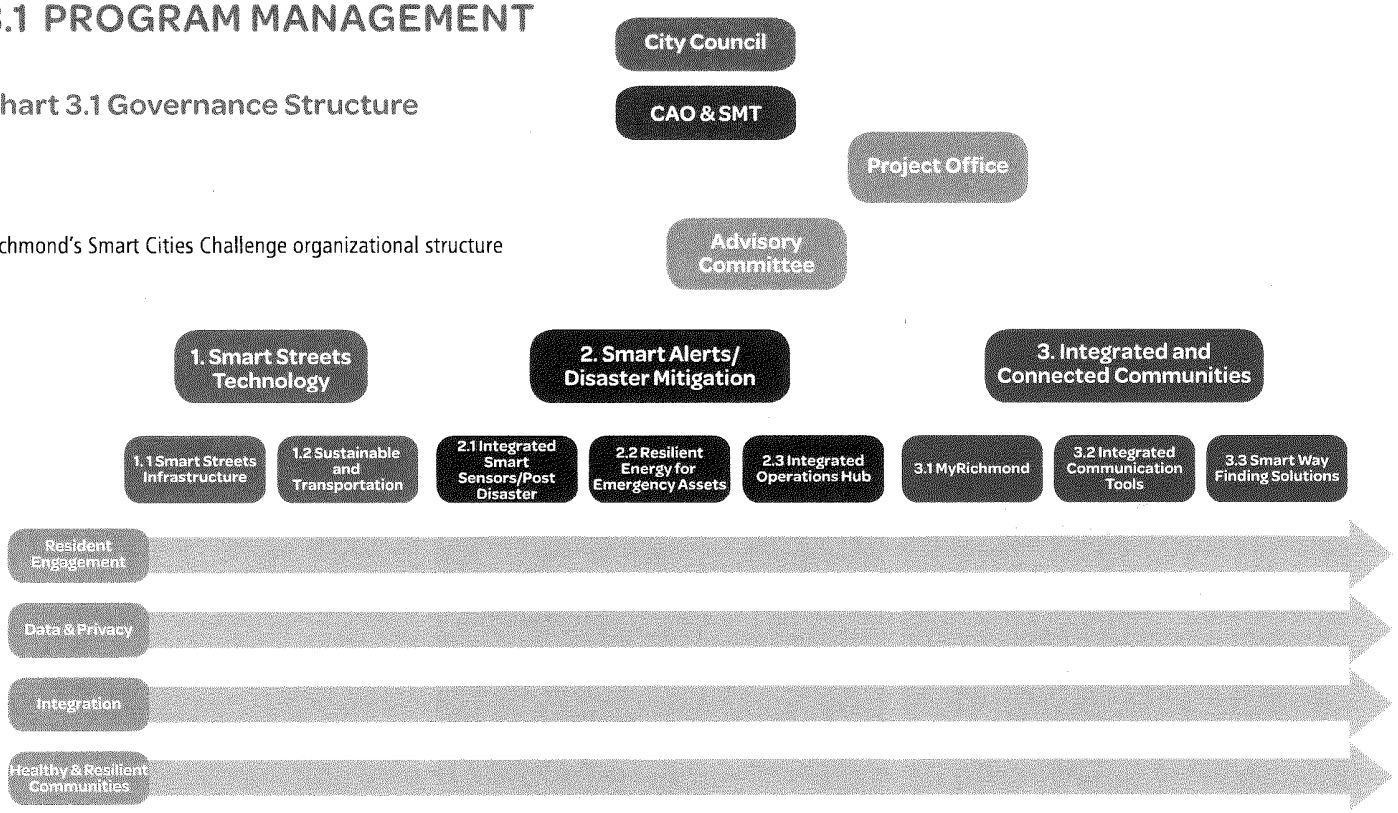
PROJECT MANAGEMENT

We have taken a programmatic approach to optimize City resources and enable effective management of our projects. Our program structure allows us to manage projects efficiently, realize economies of scale and ensure alignment with our overall Smart Cities vision, the City's core strategies and outcomes.

3.1 PROGRAM MANAGEMENT

Chart 3.1 Governance Structure

Richmond's Smart Cities Challenge organizational structure



Our Governance Structure begins with oversight and guidance from City Council, the COA and the Senior Management Team (SMT). Our Smart Cities Project Office ("Project Office"), a cross departmental body made up of leaders from across the City, has overall responsibility for the initiative. The Project Office sets the direction, allocates resources and ensures the projects align with project outcomes – on schedule and on budget.

The Project Office is supported by the Advisory Committee made up of key academic, technology and government advisors who provide input, resources and advice on the projects and technology we are implementing. Each project has a Project Lead and a cross-functional Project Team. For additional details on roles and responsibilities please refer to Chapter 5.

Four horizontal streams govern and support key activities to ensure consistent processes across all projects.

Proactive steps to identify and manage risks associated with our Smart Cities Challenge projects have been initiated. This included conducting several risk identification workshops with the project teams and external partners to identify key risks and associated mitigation strategies.

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Chart 3.1.1 Horizontal Priority Streams

RISK	DESCRIPTION
Resident Engagement	Core to our Smart Cities initiative are our residents' priorities, showcased in our challenge statement and project outcomes. We are committed to engaging them during the planning and implementation of our Smart Cities projects. We will ensure our outcomes continue to align with our residents' needs.
Data & Privacy	We have a dedicated Privacy Officer in place working with all of the Project Teams and the BC Privacy Commissioner's Office to identity and mitigate risk. We began working with the BC Privacy Commissioner early in the Challenge to steer the direction and create open communication. We are also working with the BC Chief Information Officer to understand best practice.
Integration	The City is committed to integration internally, with emergency operations and our stakeholders and partners. We will ensure a consistent, optimized approach to technology and data integration and compatibility with existing City systems. We will ensure that each Project Team supports the Smart Cities principles of Openness, Integration, Transferability and Collaboration.
Healthy & Resilient Communities	Creating opportunities for healthy living, enhanced community resilience and community benefit is a key objective. We will work to assess the opportunity for social equity and community benefit through technology, to create predictive learning for customer interests and demand for community assets.

3.2 PROJECT IMPLEMENTATION PLANS

Detailed Project Implementation Plans for each of our Smart Cities projects have been developed. These plans are the governing documents that define how each Smart Cities project will be executed, monitored, controlled, and closed. They establish the framework for project delivery and describe the objectives, scope, schedule, structure, approach and major deliverables. Plans have a defined procurement plan in place to invite technology leaders to help define the solutions. An initial Expression of Interest has gone out to the business community on BC Bid to identify partners that are interested in our project.

"Help engage us to make our neighbourhoods vibrant social connectors for all ages and situations. Help us to get to know each other and to care about our collective quality of life. Help our children to be safe, healthy and joyful. Thank you."

- Survey response

Each Project Implementation Plan includes the following information:

- Overview and Objectives
- Organization and Management
- Project Definition, Scope and Work Breakdown Structure
- Resource Assessment and Plan
- Schedule information
- Budget and Cost Estimating
- Procurement Plan
- Technology Plan
- Data & Privacy Plan
- Stakeholder Engagement Plan
- Communications Plan
- Assumptions, Constraints and Risks
- Project Measurement

Refer to Appendix 3.1 for a Project Implementation Plan template.

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3.2.1 PROJECT SCOPE DEFINITION

Our overall scope will create scalable and replicable approaches and projects and provide enhanced communications with partner agencies, improve day-to-day service delivery to the community and increase our resiliency to emergencies and climate change. We have eight projects under this scope and several test cases.

Each project has a developed Work Breakdown Structure (WBS) which lists the deliverables and work components within each of the following lifecycle stages: Initiation, Design, Implementation, Close-out, and Sustainment. This WBS supports the accurate schedule and costing of our projects.

3.2.2 BUDGET/COST ESTIMATE

Our Smart Cites total project cost is projected to be $62,336,649. Approximately $10,200,000 of this project cost is budgeted in the City's existing 5 Year Financial Plan, allowing us to adapt current capital projects under our Smart Cities outcomes lens to ensure implementation by 2024. Via the Smart Cities Challenge process, we have already attracted private sector financial contributions to help us pilot our projects (e.g.; MDA, TELUS and TIBCO). For details on the project budget and cost estimation, please refer to Chapter 8.

3.2.3 RESOURCE ASSESSMENT (HUMAN, MATERIAL, FINANCIAL)

Project Implementation Plans have been developed which detail the human, material and financial resources required. Our approach is as follows:

Step 1: Identify Required Resources

Materials – raw materials, technology, software, hardware or other products that need to be purchased to deliver the projects and their quantities.

Human Resources – roles and skills required to deliver the project and the skills and experience needed for these roles.

Financial Resources – identify funding sources and cash flow.

Step 2: Determine resource schedule

Determine the timeframes when the resources are required and a resource schedule which identifies the total quantity of each type of resource needed on a daily, weekly or monthly basis.

Step 3: Determine procurement approach

The procurement strategy will determine whether resources can be sourced internally or procured from external sources and with the help of a third party. If materials are to be sourced externally, we will follow a Request for Proposal process.

3.2.4 SCHEDULE AND SEQUENCING

Each project has a detailed, realistic and achievable schedule. Guided by the project WBS, the schedules identify and sequence the key dates and activities for implementation. In developing these schedules each project team considered:

- Project requirements (scope and stakeholder requirements)
- Project constraints (consultations, sequencing, council approvals, capital needs (e.g., permits), privacy, stakeholder acceptance, schedule risks, milestones, and deadlines)
- Dependencies and related projects/initiatives
- Process for project review and consulting with Project Office and key stakeholders to adjust as required.

Project schedules will be used to plan, manage, track and report activity sequencing, scheduling and progress. Our individual project schedules have been consolidated into a single program level schedule. Included is a listing of schedules and sequences of our key projects.

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Table 3.2.4 City of Richmond – Smart Cities Implementation Schedule Sample

		2019				2020				2021				2022				2023				2024	
	KEY ACTIVITIES	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
	Program Level Activities																					
Program Level Management, Support and Activities	Program Management																					
	Program Level: Resident Engagement																					
	Program Level: Partner Engagement																					
	Develop Data Sharing Agreements																					
	Smart Streets																					
	Smart Streets																					
Smart street lights	Initiation and Planning																					
	Prototype																					
	Preliminary Design																					
	Detailed Design																					
	Implementation																					
	Closeout																					
Install fibre optics cable and deploy smart cameras	Initiation and Planning																					
	Preliminary Design																					
	Prototype																					
	Detailed Design																					
	Implementation																					
	Fibre optic install -100 intersections																					
	Closeout																					
Develop a plan for information flow from sensor location to central Hub	Initiation and Planning																					
	Preliminary Design																					
	Detailed Design																					
	Implementation																					
	Closeout																					
Installation of a GPS based emergency pre-emption system at signalized intersections	Initiation and Planning																					
	Preliminary Design																					
	Detailed Design																					
	Prototype																					
	Implementation																					
	Closeout (concurrent)																					
Installation of additional features in the Advanced Traffic Management System (ATMS)	Initiation and Planning																					
	Preliminary Design																					
	Detailed Design																					
	Implementation																					
	Closeout (concurrent)																					
Installation of Uninterruptible Battery Backup System (UPS) at all signalized intersections	Initiation and Planning (Complete)																					
	Preliminary Design (Complete)																					
	Detailed Design (Complete)																					
	Implementation																					
	Closeout																					
	Sustainable Transportation																					
Increase EV use and ownership	Initiation and Planning																					
	Preliminary Design																					
	Detailed Design																					
	Implementation																					
	Closeout																					
Mobility hubs	Initiation and Planning																					
	Preliminary Design																					
	Detailed Design																					
	Implementation																					
	Closeout																					

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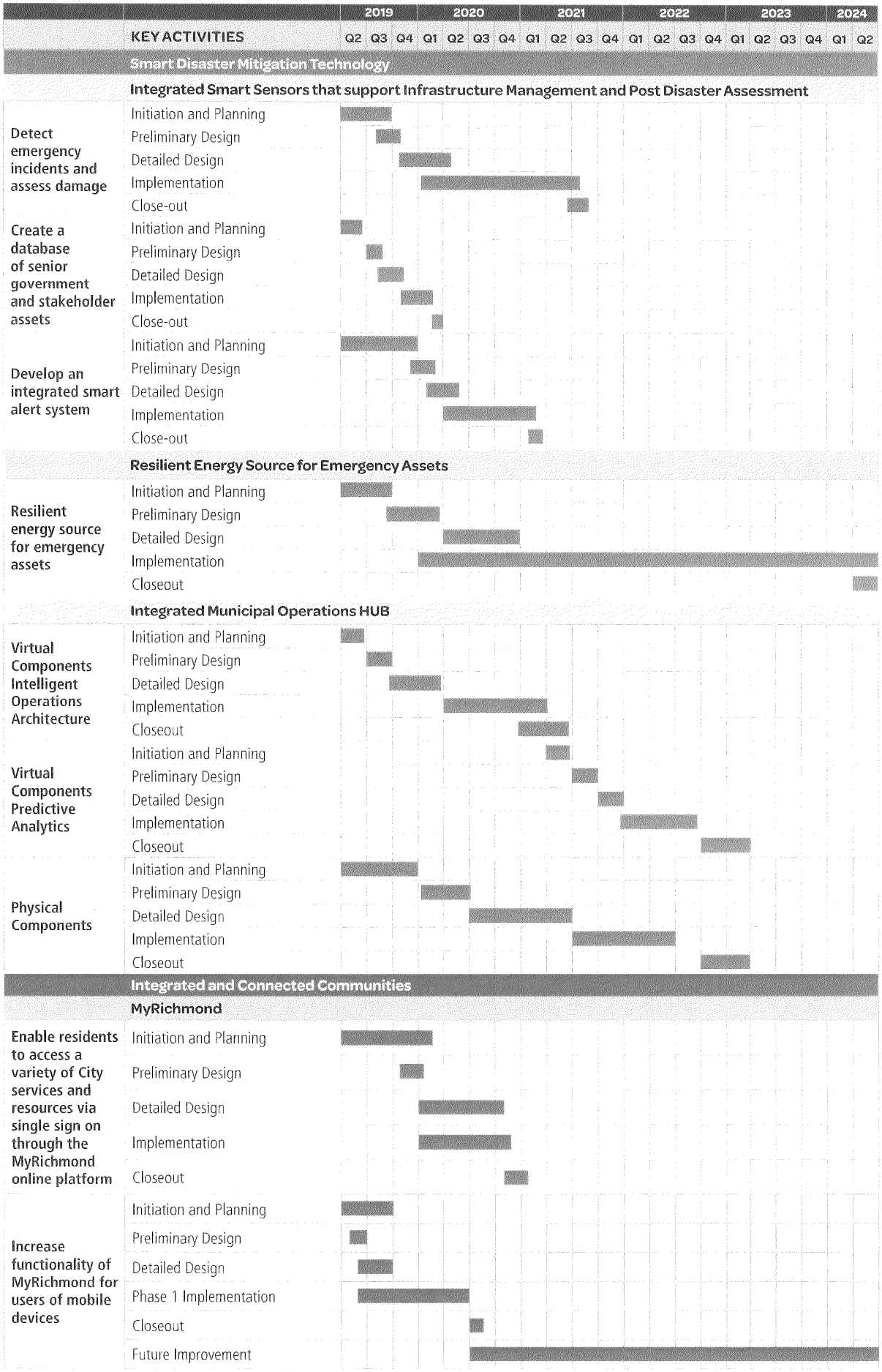

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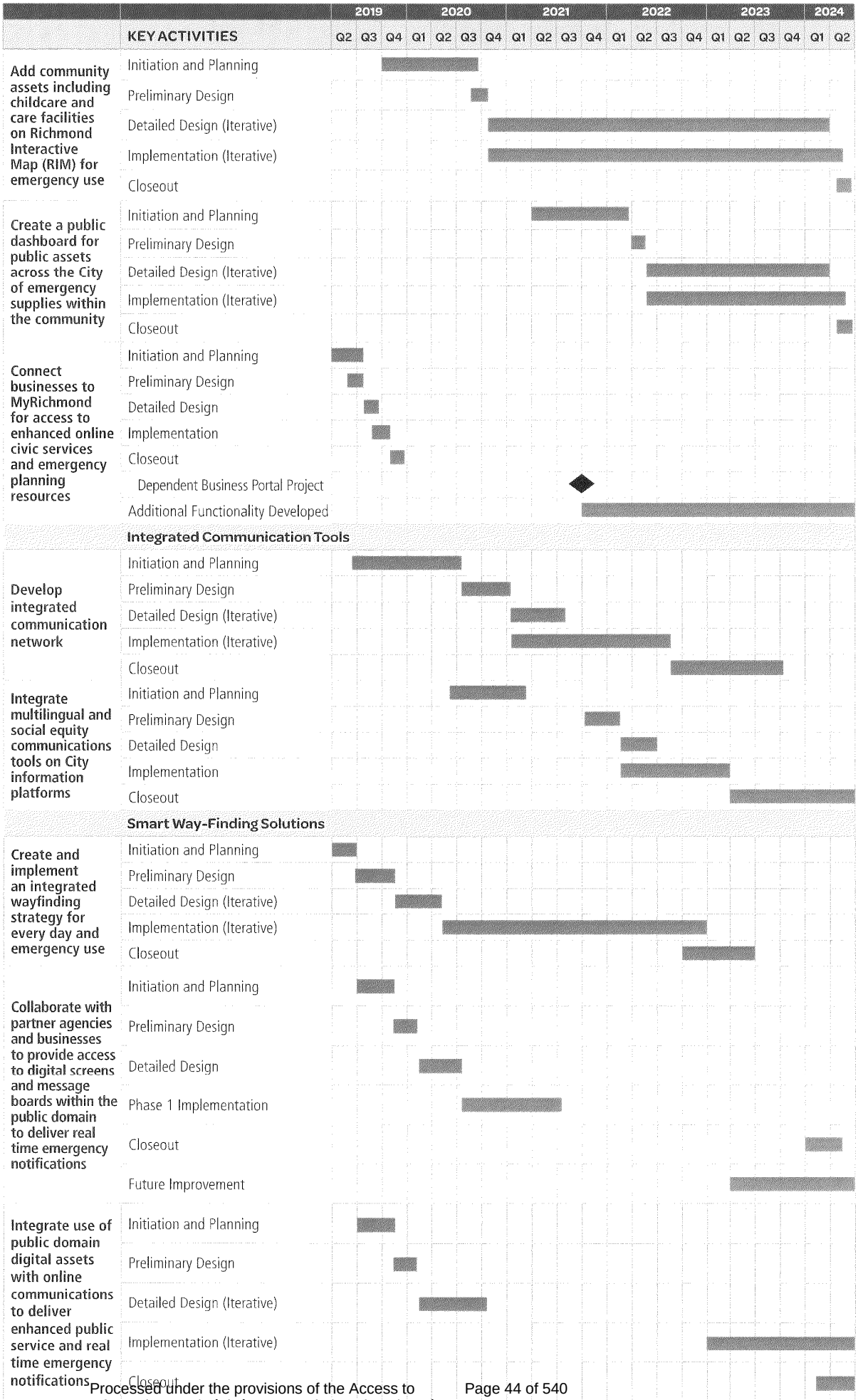

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3.3 RISK STRATEGY

Each project team has identified key risks, mitigation strategies and accountabilities. Our risk management process occurs throughout the lifecycle of a project and is as follows:

Identify: Define each risk, and its category, root cause, and consequence(s).

Analyze: Assess the impact, likelihood and priority of each risk.

Treat: Determine the strategy and actions for managing risks and the cost of implementation.

Allocate: When a risk materializes, the respective risk treatment is released to address that risk.

Monitor & Report: Ongoing tracking of existing and new risks, executing response plans, evaluating the effectiveness of the responses; and reporting results to key stakeholders.

Risk management process

3.3.1 RISK STRATEGY - WORK TO DATE

Proactive steps to identify and manage risk associated with our Smart Cities Challenge projects have been initiated. This included conducting several risk identification workshops with the project teams and external partners to identify key risks and associated mitigation strategies.

Each of our projects has a risk log managed by the Project Lead and a risk log at the program level to track overarching program risks (refer to Appendix 3.2 for a Risk Log template).

3.4 PROCUREMENT STRATEGY

The Smart Cities Challenge has motivated the City to optimize our procurement approach and maximize the benefit of our relationships with the private sector. Our approach is centered on collaboration with the private, academic and public sectors.

City procurement processes meet Federal Government standards and are designed to be responsible with our public dollars. The following goals guide the Procurement Strategy for our Smart Cities Initiative:

Chart 3.4 Goals for Procurement Strategy

GOAL ONE: Innovate and achieve outcomes	We look to achieve value for money while also procuring innovative products that deliver value to our residents to maximize the social and environmental value of goods and services procured. This requires flexible processes to capture market innovation and being more open to new-to-market products and services.
GOAL TWO: Encourage efficiencies	We strive to move away from complex, lengthy and restrictive procurement processes and are actively working with our stakeholders to create processes with greater transparency, flexibility and simplicity.
GOAL THREE: Create opportunity for local businesses large and small	We are committed to ensuring our procurement process creates opportunities for businesses of all sizes. We have built flexibility and simplicity into our public tender approach to ensure that our processes are proportionate to the size of the procurement. This involves early engagement, employing right-sizing principles in procurement planning and providing greater transparency.
GOAL FOUR: Ensure transferability and replicability of results	We will create the opportunity for transferability and replicability by being technology agnostic. This ensures greater transferability to other communities who are looking to implement the same systems.

Refer to Appendix 3.3 for Anticipated Procurement Opportunities.

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3.4.1 PROCUREMENT STRATEGY - WORK TO DATE

Potential opportunities for shared procurements were identified. The business community was consulted in the initial and Finalist Phase to understand how engagement is best initiated. During the finalist phase of the Smart Cities Challenge we issued a Request for Expression of Interest ('RFEOI') asking for parties interested in participating in our Smart Cities Challenge initiative and provide early information to structure future communication and procurement processes. The objective of the RFEOI is to provide the City with qualified technologies, vendors, contractors or services to support our work program, while also soliciting input on our Smart Cities initiative, leading practice, processes, and considerations for future RFP processes. Refer to Appendix 3.4 for a copy of the RFEOI.

The City has also recruited participation from technology companies at venues such as the BC Tech Summit and other networking events.

3.4.2 PROCUREMENT OPTIONS: START-UP IN RESIDENCE (STIR) PROGRAM

The Smart Cities Challenge is helping the City prepare to become a Smart City and reach out to the technology community to form new partnerships and relationships to help solve key issues. Procurement will take several forms as some of the outcomes we want to achieve have no solutions to date, even from the private sector. Some procurement will be straightforward, for example, installing 15 smart traffic lights at high risk intersections and some of the other areas will take a team approach, such as the work being conducted through the Innovation Superclusters Initiative, led by MDA, to identify and mitigate the risk for flooding, toxic spills and earthquakes.

Volunteers and community members celebrating Richmond's participation in the Smart Cities Challenge.

The Superclusters Initiative is a key example of a Start-up in Residence (STIR) program. Governments can access innovative, private-sector solutions to solve public challenges. Although MDA is an established company and not a pre-commercialization start-up, they are recruiting start-up technology companies to help solve the issues.

Benefits to government:

- solves the problem without having to take on the risk or spend involved in the development cycle;
- they have ongoing, iterative input to ensure the end product is exactly what they need; and
- business continuously improves and updates the product.

A letter of understanding for the Innovative Superclusters Initiative is in Appendix 1.3.

"Richmond's vision for a smarter city promises a future that is more inclusive, sustainable and prosperous for its citizens, while laying the foundation to share and scale benefits across the country to all Canadians and offer exciting export opportunities to build better communities globally.

The Smart City Challenge team at Richmond has been a role model for bringing together disparate departments, the public and private sector, and multiple jurisdictions of government together with the cohesive mission to better the lives of their citizens."

- Mark Masonsong, CEO & Co-Founder, UrbanLogiq

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3.5 STAKEHOLDER STRATEGY

A comprehensive stakeholder identification, management and engagement plan was created to improve interactions with our project partners, residents and other stakeholders. Please refer to Chapter 6 for details.

3.6 MONITORING AND REPORTING STRATEGY

A traditional monitoring and reporting strategy was adapted to measure cost, schedule, quality and risk, and to include a measure against our project outcomes.

The Team Lead for each project is responsible for monitoring and reporting for individual projects.

The Project Office is responsible for reporting to the CAO and Senior Management Team monthly and City Council on a quarterly basis.

3.6.1 PROJECT MONITORING

We are using a variance analysis approach to monitor and measure cost, schedule, quality and risk against baseline measures established during the planning phase and documented in our Project Implementation Plans. This involves monitoring any deviations of project work against what was planned in the project scope, schedule, costs, outcomes and risk.

Chart 3.6.1 Variance Analysis Approach

Cost	A baseline budget was established for each project that serves as a fixed point of comparison against which actual performance and progress are compared throughout the project lifecycle. Costs will be tracked and reported on through a combination of the PeopleSoft Financial System and standardized spreadsheets.
Schedule	Microsoft Project scheduling software will be used to plan, manage, track and report activity sequencing, scheduling and progress on each project. The project schedules present an estimation of the work breakdown, dependencies, durations and start and completion dates of the forecasted activities required to deliver the scope.
Quality	Quality is measured against functionality and scope identified in the Project Implementation Plans. Quality measurements are guided by the City of Richmond's Quality Management System and our Smart Cities outcomes.
Risk	Each project has a risk register that is managed by the Project Lead. We also have a risk register at the program level to track overarching program risks. New and existing risks are continually tracked, re-analyzed and ranked as the projects progress, risk treatment strategies are implemented and monitored as the nature of the work changes and/or external project factors change.

In addition to these traditional project measures, we are also monitoring our projects against our outcomes as well as the projects' adherence to a Smart Cities principle of Openness, Integration, Transferability and Collaboration.

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3.6.2 OUTCOMES MONITORING

A process has been established to continually assess the strategic value of the projects to ensure that they are delivering against outcomes. We will also measure and report on our performance against the Smart Cities principles of Openness, Integration, Transferability and Collaboration, as well as Leadership and Governance and overall Level of "Smartness" achieved by the City. Refer to Chapter 2 for more information on our performance measurement strategy.

3.6.3 PROJECT REPORTING

We will provide regular and consistent information on the progress of our projects through use of the following reports:

1. **Project and Program Dashboards -** single page to provide meaningful and actionable information; this includes alignment to our Smart Cities outcomes.
2. **Summary Management Report -** provided weekly to the Project Office by the Project Leads.
3. **Risk and Issues Reporting -** will take the form of each project's Risk Register which will be regularly updated.
4. **Budget Summary Cost Report -** detail project costs to date and any required changes to the budget.
5. **Milestone Schedule and Forecast -** a summary of project status and a snapshot of upcoming project activities.

Richmond is a finalist in the Government of Canada's Smart Cities Challenge. Find out more about Richmond's proposal at smartcity.richmond.ca

3.7 CHANGE MANAGEMENT SUPPORT

In order for our project to continue to shape the transformation of City operations and the new Smart Cities framework is clearly embedded in our integrated approach, we must ensure resources are aligned to sustain the change. To respond effectively to a Smart Cities Challenge, municipal governments must be prepared to alter the status quo and we recommend a comprehensive change management program to support the initial phases of development, as well as the five year work plan implementation.

To effectively follow the principles, municipal government must be prepared to take risk, develop new partnerships and start conversations about new ways of solving difficult issues faced by Canadian cities.

Continued innovation and collaboration will be achieved through inviting more stakeholders to the decision-making table and an acknowledgment that municipal governments alone cannot solve the complex issues ahead of us; that together we are stronger.

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3.8 SUSTAINMENT STRATEGY

A multifaceted project sustainment strategy was developed and seven core components were identified. The results will ensure Smart Cities principles are engrained in the City's culture and reflected in all future city initiatives:

Chart 3.8.1 Project Sustainment Strategy

Leadership for Change

Our dedicated team of leaders are committed to championing the benefits of our Smart Cities projects and ensuring that they continue to meet the needs of our residents and partners.

Collaboration

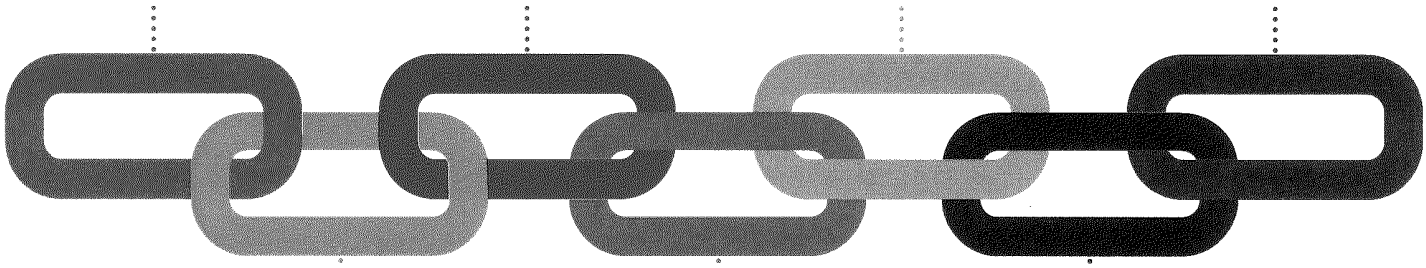
Our Partners will be key in the development and implementation of our Smart Cities solutions and their continued collaboration will help sustain our projects moving forward.

Financing

Our well defined financing requirements and continued transparency ensure upfront commitments are understood that will enable sustainment of our Smart Cities projects.

Evaluation

Presentation of our evaluation data and findings to the Project Advisory Committee and City Council at regular intervals will ensure continued support for our projects.



Alignment

Our Smart Cities projects are aligned to wider city initiatives and strategies, as well as the priorities of our residents and stakeholders.

Communication

Our multi-channel engagement strategy is a critical way to build and maintain a base of support that will help sustain our Smart Cities projects.

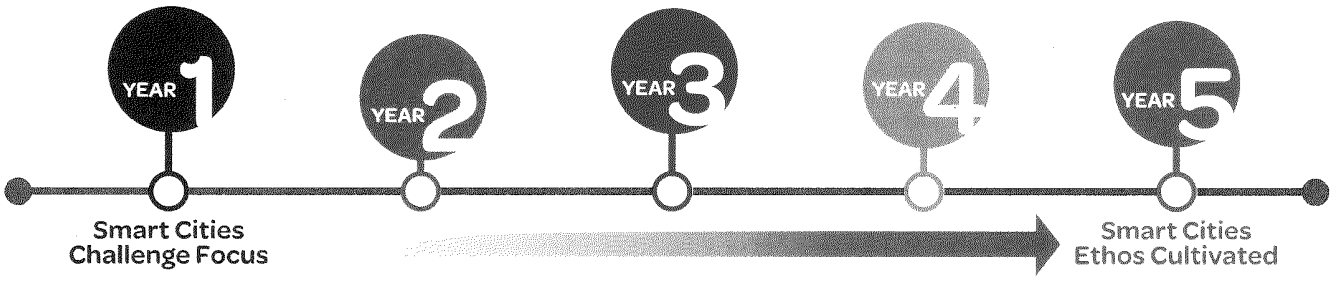
Flexibility

To allow for changing circumstances, uncertainty and course correction, we have built flexibility into our projects implementation plans.

We are taking this approach to drive Smart Cities principles beyond the scope of our Challenge Statement. Smart Cities principles have been transformational and will become an inherent part of City services and further enhance the quality of life of our residents.

We have accounted for this sustainment strategy and in our Smart Cities program implementation plan and costs. The City will align resources as required to realize the outcomes of the Smart Cities Challenge.

Chart 3.8.2 Recommended Plan for the Corporate Integration of the Smart Cities Principles



The corporate integration of Smart Cities principles.

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3.9 RISKS AND MITIGATION

Table 3.9 Project Management Risks and Mitigation

RISK	DESCRIPTION	MITIGATION
The scope of the project changes	Scope changes delay project and/or cause budget increases.	Ensure individual project scope aligns with overall program objectives and outcomes from the beginning; allow for flexibility in design.
Identified resources are not available	Project team loses momentum and/or effectiveness; key staff members leave; availability of resources with the skills and experience required for the project.	Resource planning completed prior to project commencement; clear communication of resource need; effective change management plan; transition plan in place; well defined roles and responsibilities.
Misalignment between project and stakeholder expectations	There is a risk of a mismatch between stakeholder expectations and the project plans, which could result in a need to adjust project plans.	Communicate project plans, progress, impacts and benefits to community members and stakeholders to ensure they are fully informed about the Project and that the Project team members understand their interests and concerns.
Proof of Concepts or Test Cases Fail	Attempts to pilot innovative technologies do not produce desired results or outcomes.	Use a learning-based approach and ensure cross-functional teams include government, academic and technology members.
Stakeholders become disengaged	Stakeholders ignore project communications and not participate in engagement activities.	Engage early; ensure projects remain aligned with stakeholder needs; multi-channel engagement to capture wide audience; easy to access engagement tools.
Lack of interest from suppliers during procurement	Lack of responses to procurement requests.	Clear timelines; clear RFP documentation; early and regular engagement with the market.

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TECHNOLOGY

Our focus is on protecting our island city, collecting critical information from an integrated network of smart sensors, cameras, databases and systems within the City and across stakeholder organizations, and connecting the data through a secure network to our Intelligent Operations Hub. This data will be crunched into useful information that will allow for more informed decision-making, and communicated with the public and stakeholders across multiple media platforms. This will enhance the safety, security and mobility of our community. This focus stems from the challenges and risks Richmond faces as an island city in regard to flood protection, toxic spills in the Fraser River, earthquake risk, traffic management and isolation during an emergency.

To create these scalable, resilient virtual platforms that are seamlessly integrated across all levels of government, we are focusing on outcomes and are, therefore, technology agnostic in our Smart Cities solutions. Our project is committed to open architecture and ensuring that our systems can be replicated by other communities. This involves procuring non-proprietary, multi-vendor components and using modular architecture where each component is "plug and play" and can be taken out and replaced with minimal impact to the other components in the system.

4.1. TECHNOLOGY ADVISORS [1]

Members of our Advisory Committee are supporting our Smart Cities Challenge with insight, expertise and resources. They act as a catalyst for innovation, challenging us to think in new ways and change the way we approach problems. Our technology advisors are identified below, along with the key roles they are filling.

ADVISOR	ROLE
Ameresco	Resilient and renewable energy technology advisor
Aware 360	Emergency response technologies and leading practice technology advisor
Corix	District energy applications and sustainable energy resources technology advisor
E-Comm 911	Emergency management data integration and dispatch systems technology advisor
IBM / Lightship	Field operations and incident management platform technology advisor
MDA Corporation	Geospatial, smart alert and decision support systems technology advisor
Sierra Wireless	IoT and wireless communications technology advisor
TELUS	Fibre optics and LTE provider and Smart Cities ecosystem and networking innovation advisor
TIBCO	Machine learning based algorithm and real time traffic management, and integration technology advisor
Transoft Solutions	Design technology and innovation advisor
UrbanLogiq	Visual analytics, data visualization technology advisor

As we transition to the implementation phase, we will further engage with technology vendors and service providers through formal procurements (guided by a procurement strategy detailed in Chapter 3). To optimize this engagement, we have requested market input to inform this process through an RFEOI process.

1 As the term 'Partner' with private sector groups would require formal agreements, and therefore a public process, we have chosen to use term 'Advisor' until a public tender process can be undertaken.

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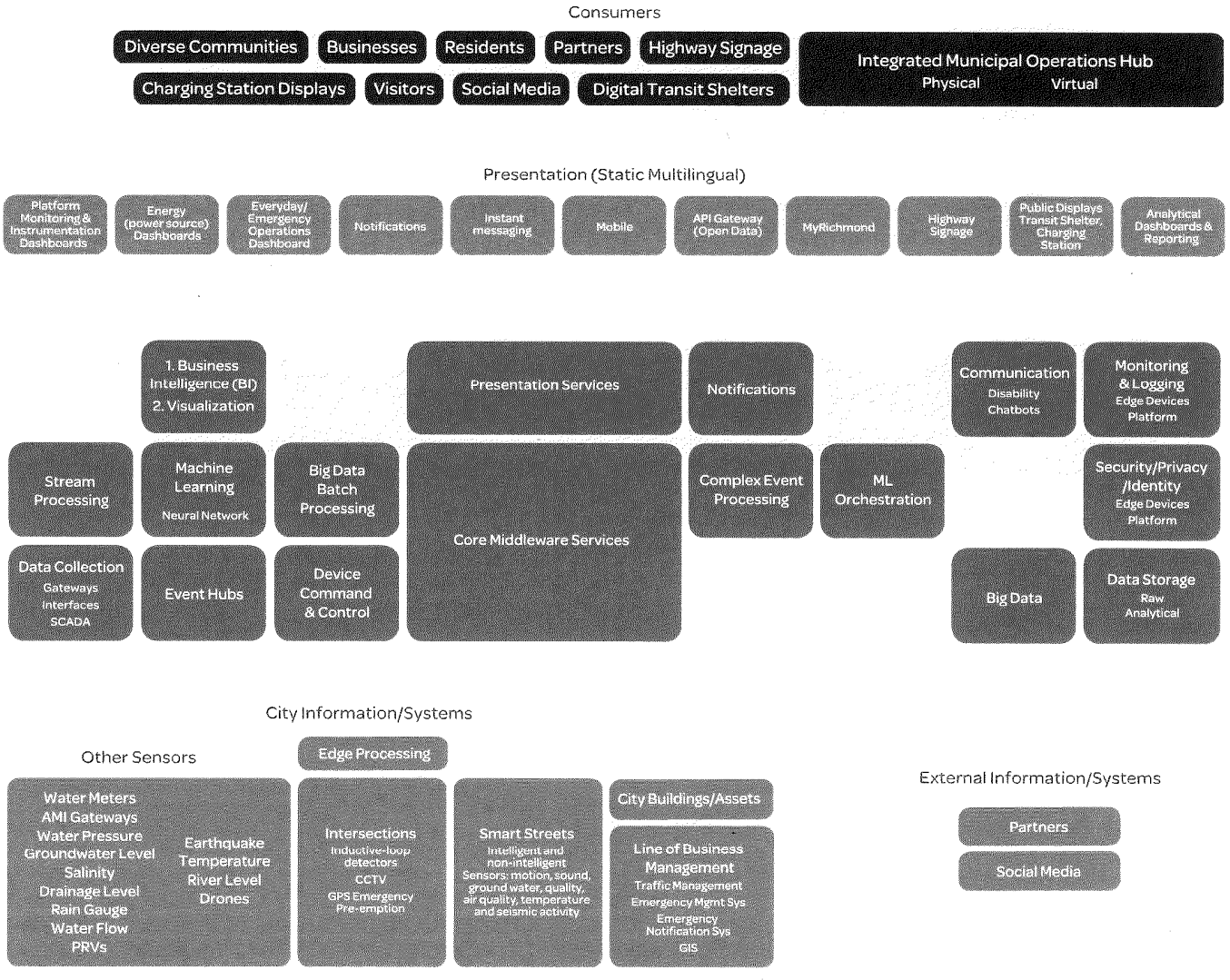
4.2 OVERARCHING ARCHITECTURE

The Intelligent Operations Hub is at the core of our Smart Cities project and acts as the supporting and enabling infrastructure for our corresponding projects. It integrates a number of key technologies: IoT, Microservices, Machine Learning (ML), Big Data and Stream Processing, and provides the architecture which supports the technology, information and systems we are implementing within our projects. Our Intelligent Operations Hub architecture has the built-in ability for self-learning and self-improvement. This means that as the component parts and capacity of the system are updated, the Intelligent Operations Hub is able to evolve and improve.

Chart 4.2 Suggested Overarching Architecture for Intelligent Operations Hub



Smart Cities High Level architecture.

We know that we cannot create this architecture by ourselves. We are advised by local and leading technology advisors to design and implement the necessary components to establish the Intelligent Operations Hub and deliver on our outcomes. We will work with our government partners toward creating Data Commons in risk areas including flood mitigation, toxic spill response, earthquakes and traffic management.

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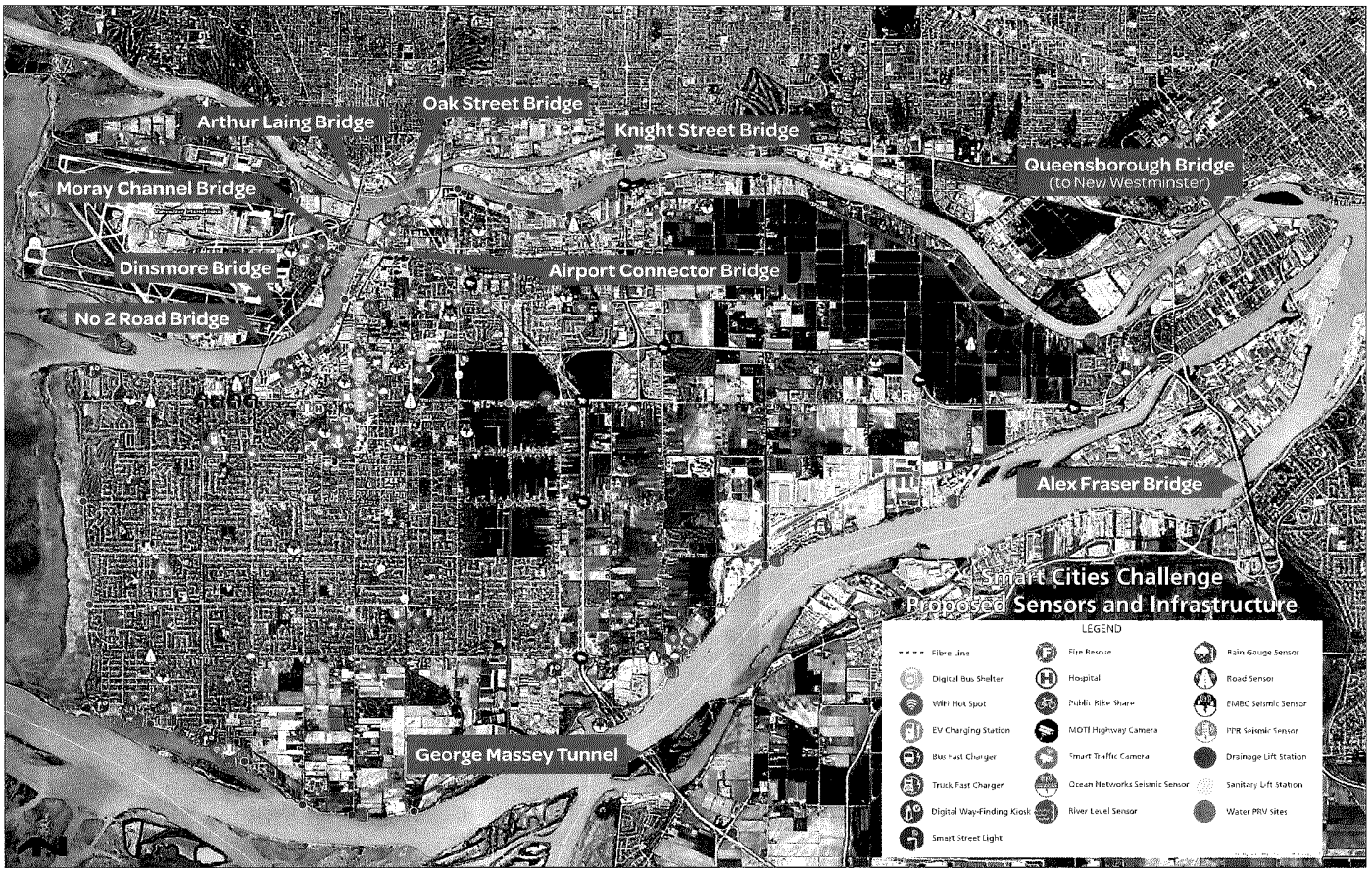
4.3 DATA FLOW

Collectively our projects combine to create a process in which data, from multiple sources and entities, is collected, transmitted, integrated and processed to create valuable information. This improves our ability to make decisions, deliver services, respond to incidents and communicate to residents. It also allows us to effectively share data, information and insights with other levels of government and community advisors - increasing the reach of our digital intelligence and providing valuable data from our advisor organizations. Our situational awareness will be enhanced through the sharing of important information from key stakeholders in such areas as earthquake early warning or flood mitigation sensor information from.

The sensors installed on street lights, at traffic intersections, and on other City assets such as buildings, dikes and transit shelters transmit data to the City's data centres and Intelligent Operations Hub over a secure network supported by fibre and LTE networks. The following diagram is a visualization of some of the key sensor information that will be processed through the Intelligent Operations Hub.

Chart 4.3 Smart Sensors and Infrastructure - City and Advisors



Map of Richmond indicating existing and proposed sensors and infrastructure

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4.4 AGGREGATED AND CATEGORIZED DATA

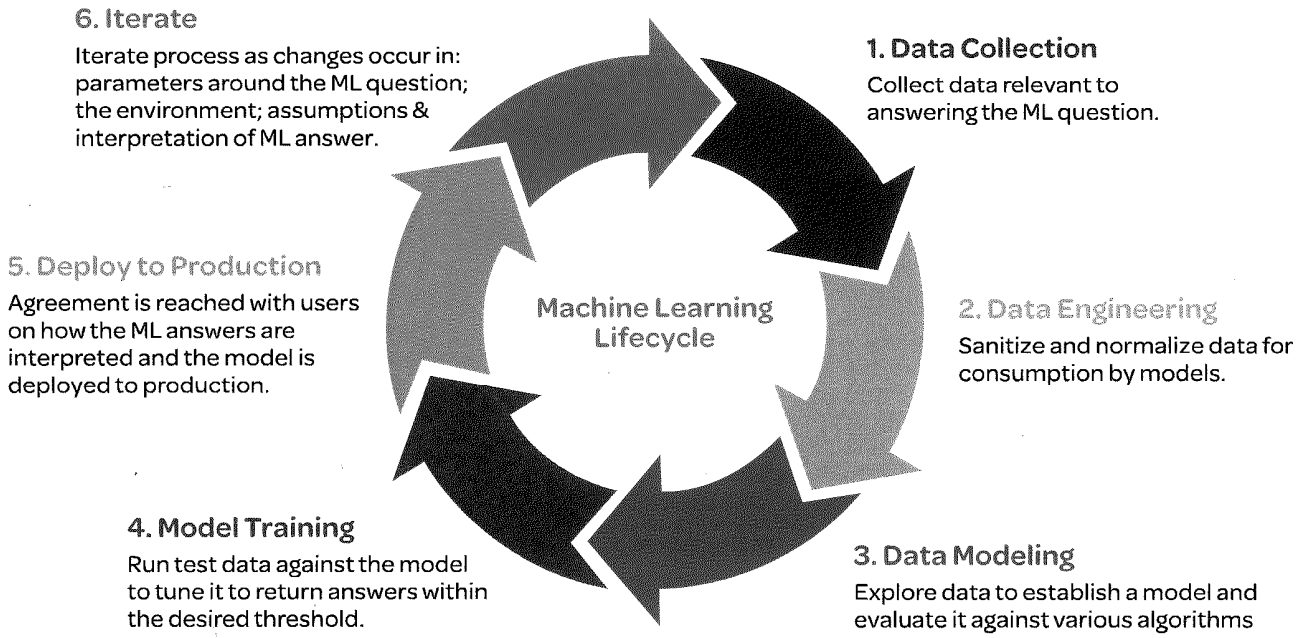
Once the data is collected in the Intelligent Operations Hub, it is marshaled into a central Data Lake repository. Depending on the type of data, it will have varying levels of security. Richmond will adopt the system similar to that used by the Province of BC symbolizing stop light scenarios to categorize data:

1. **Green Data:** Open to the public i.e., number of park benches, traffic cameras, weather data, tide data
2. **Yellow Data:** Information that is safety related or required for real time City operations, but no personalized information – will be available to partners in secure manner i.e., flood mitigation information, dike safety
3. **Red Data:** Information with personalized information i.e., MyRichmond registration information, tax payment information

The Data Lake is a data repository we will use to create the "memory" and "thinking" component of our digital intelligence. It acts as a source of data for Data Scientists to develop algorithms and relationships that can be used to build machine learning models used to predict incidents, maintenance schedules and demands on City services. Data Engineers can also work on the data lake to clean up and convert data into formats more easily consumed by other components and platforms. Finally, the Data Lake is a source for visualization of business intelligence dashboards to allow City staff to deduce insight. Some of the data arriving at our data centres will be used for immediate display, real-time machine learning, and triggering alert notifications. The information processed will be published in both a private version (for partners and other levels of government) and a public version (community). The publication will use REST based interfaces and will be created as an Open API.

The table below identifies the technology associated with each step of our data flow.

Chart 4.4 Machine Learning Lifecycle



Machine learning lifecycle

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Table 4.4 Data Flow Technology

ACTIVITY	OUTCOME
Collect	• Various sensors will continually gather data and periodically send it to the Intelligent Operations Hub. • Certain sensor types and smart cameras will gather data, perform edge processing, and send processed results to the Intelligent Operations Hub. • Satellite data and variation analytics will be collected and sent to the Intelligent Operations Hub. • The Intelligent Operations Hub will integrate with City backend systems to collect events. • City applications may collect information with consent and send it to the Intelligent Operations Hub. • Advisor will transmit information to the Intelligent Operations Hub.
Connect	• Sensor data transmission is achieved through industry standard mechanisms tailored for IoT protection such as OAuth2 authentication and bearer token validation. • Data encryption is used where applicable. • Intelligent Operations Hub integration with backend systems and external systems uses best practice Enterprise Integration Patterns (Fowler, Hohpe) and standard protocols (e.g., REST, SOAP, JMS). • Intelligent Operations Hub stores the data it receives in a format that scales to Big Data volume (e.g., ORC, Avro, Parquet). • Intelligent Operations Hub components: Data Collection, Event Hub, Big Data, Storage, and Security/ Privacy/Identity are responsible for this phase.
Crunch	• Different use cases require different "crunching" for optimum results. Components include Business Intelligence, Stream Processing, Big Data Batch Processing, Machine Learning, and Complex Event Processing that operate on the data lake. • Business Intelligence crunching involves transforming data into specific schemas to produce answers. • Big Data Batch Processing crunching includes Hadoop MapReduce. • Stream Processing crunching includes Apache Kafka and Spark, TIBCO StreamBase. • Complex Event Processing crunching in the Smart Cities use case focuses on deriving events from business rules, using the Rete algorithm or some variant of it. • Machine Learning crunching uses algorithms to produce insights. Common use cases may take advantage of commercially available machine learning services (Azure Cognitive Services, Google Cloud AI Building Blocks). Refer to the Machine Learning Lifecycle diagram above.
Communicate	• To communicate with advisor organizations, City systems and Smart Cities applications will leverage standard protocols similar to the ones used in "Collect": REST, SOAP, JMS, etc. to allow further processing by recipients of the communication. • Share processed visualizations such as dashboards, charts, and GIS maps directly through URLs. • Open APIs will allow public and private applications to consume public non-sensitive information. • We will communicate with the public through the MyRichmond application and Emergency Notification System.

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4.5 FUTURE-PROOFING APPROACH

Flexibility has purposefully been built into our Smart Cities architecture by not being specific about product and brands used. Further, the approach uses modular architecture, which means that each component is "plug and play" and can be taken out and replaced with minimal impact to the other components in the system. This built-in flexibility ensures that the technology solutions and systems within our projects will remain relevant as technology evolves, therefore ensuring project sustainment in the future. This has the added benefit of ensuring greater transferability to other communities who are looking to implement the same systems. Our architecture also has the built-in ability for self-learning and self-improvement meaning that as the technology and capacity of the system is updated the Intelligent Operations Hub is also able to evolve and improve.

In addition, and as detailed in Chapter 3, the principle drivers of our procurement approach will be to ensure that reputable technology providers are selected that allow for transferability and replicability of the technology. A major component of our evaluation criteria will be based on non-proprietary technology and services.

4.5.1 TEST CASES ROLES AND RESPONSIBILITY

In all test cases, Richmond will work collaboratively with integrated project teams. All predictive models created will be owned, or co-owned by the City to accommodate Smart Cities Principles.

4.6 ACCESSIBILITY AND MULTILINGUAL TECHNOLOGY

Integral to our revised outcome to Integrate Communications and Enhance Community Resilience, are solutions to bridge communication barriers. We have to ensure that our proposed Smart Cities solutions can be accessed and used by non-English fluent residents, with disabilities, and residents with low technology literacy or other barriers to access. Specifically, we are:

- Integrating viable multilingual tools into our existing City public information platforms.
- Implementing easy-to-use multilingual tools on City mobile devices for first responders and other staff for use in face-to-face communications with non-English speakers.
- Identifying, assessing and implementing technology solutions that go beyond text input to speech to bridge language barriers (such as: translation apps, AI based chatbots, third party translation services, etc.).
- Incorporating visual, audio and other sensory techniques and international standards into all City communications platforms to ensure messaging is comprehended by all regardless of sight, hearing or other impairments.
- Updating and developing our digital platforms to be compatible with assistive technologies such as screen readers that read aloud web pages, screen magnifiers that enlarge web pages, and voice recognition software that is used to input text.
- Establishing robust communications networks and processes to ensure general public information and emergency notifications are accessible and deliverable to isolated residents, including the homeless, seniors living alone or in care homes, and those lacking in general or digital literacy, as well as those individuals isolated by mental or physical illness, language or cognitive barriers, and/or lack of online connectivity.

We have also made sure we are documenting everything from our original thought processes and planning to our approach to implementation and maintenance. This will allow future employees to easily get on board with the technology and architecture in place and other cities to replicate our work.

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4.7 LEGISLATIVE AND REGULATORY COMPLIANCE

Our technology and data plan adheres to all legislative and regulatory requirements. We have worked with the British Columbia Privacy Commissioner throughout the Finalist Phase. For additional details on how our data management plan ensures legislative and regulatory compliance please refer to Chapter 7.

Family enjoying mobile digital information.

4.8 WORK TO DATE

The City has invested $5.8 million in Richmond's Digital Strategy initiated four years ago. Additional annual investments are made in flood mitigation, drainage and traffic. We will be leveraging significant components of the Digital Strategy and other City programs as part of our Smart Cities implementations. Specifically:

- We have already implemented some core middleware services of the Intelligent Operations Hub which will support the technology being implemented under our Smart Cities projects.
- We have developed the presentation services, the systems for monitoring and logins and the security for protecting privacy and identity.
- MyRichmond is a mature single sign-on online platform ready for the integration of additional data sources and the functionality for notifications we will be developing.
- We are also leveraging a significant investment in sensor technology across the city and will be updating and integrating sensors that include drainage sensors, river level sensors, water meters, rain sensors, flow sensors, pressure sensors, temperature sensors, salinity sensors, transportation and traffic count sensors and road temperature sensors.
- Richmond invests $11.6 million per year in flood mitigation including technology to monitor disaster mitigation assets. The Innovative Superclusters Initiative project team has already began working with operations staff to prepare for our first test case on early detection of flooding.

4.8.1 PROJECT PLANNING

As detailed in Chapter 3 – during the Finalist Stage we developed robust Project Implementation Plans for each of our projects. These plans included the identification of required technology and the associated resources and advisor requirements to enable implementation.

Technician reviewing data from City sensors.

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4.8.2 PROOF OF CONCEPTS/TEST CASES

We have completed or initiated a number of proof of concepts to prove functionality, test data flows, surface learnings and test cases and inform the full project implementation. Our advisors have supported these initiatives providing key resources, expertise and financial support.

TRAFFIC INCIDENT PREDICTION - SENSE & RESPONSE	COMPLETE
This proof-of-concept combined traffic sensor data and ICBC crash data between 2012 and 2016 in the high traffic Steveston Hwy-No. 5 intersection and surrounding area to feed into the Sense and Respond platform. The platform then visualized historical events to aid staff in detecting trends and patterns in traffic incidents. Visualizations included charts of incidents by weekday, incidents by time of day, and average vehicle speed by time of day, the second outcome of the proof of concept was to apply the data to a machine learning algorithm to produce predictive analysis of traffic accidents. The third outcome of the proof-of-concept was to feed the data as a live stream to the Sense and Respond platform to produce visualization and predictive analysis in real-time, and to trigger alerts for actions that require intervention. The result was a neural network model that was able to correctly predict traffic incidents 30 minutes in advance with an accuracy rate of 60%. In summary, the platform proved the capability to produce visualizations for staff-led analysis and improvement planning, and the capability to sense incidents that are likely to occur, and respond by alerting the appropriate teams to act. Future steps for the proof-of-concept would include placing additional types of sensors to improve data variety and accuracy, and placing additional sensors across the city to improve coverage.	
Advisors	TIBCO

SUPERCLUSTER - SITUATIONAL ANALYSIS & VISUALIZATION	BEGINS 2019
We are collaborating with MDA, the Province of BC and others on a test case submission to the Government of Canada's Innovation Superclusters Initiative Program. It will integrate new and existing sensor and weather data, Provincial data, from BC Hydro Smart Meters and more to predict risk in the following areas: • The early detection of risk and mitigation of floods/liquefaction/earthquakes; • The early detection and mitigation of spills in the Fraser River; and • Factors affecting traffic collisions due to weather events and varying traffic speed. All scenarios will mitigate the impact of climate change and directly improve the safety of our community. The results of these test cases will inform the future direction of our Smart Cities projects.	
Advisors	MDA; Amazon; EMBC; BC Hydro; Vancouver International Airport; BC Ministry of Forests, Lands and Natural Resources Operations; BC Ministry of Transportation and Infrastructure; Industry Canada; Environment Canada; Musqueam Indian Band; Fraser Basin Council; Simon Fraser University; Kwantlen Polytechnic University; University of British Columbia; BC Institute of Technology; Local tech companies (start-ups); Lightship (tbd); IBM (tbd); Weather network (tbd); insurance companies (tbd).

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DRONE - INSPECT & ASSESS	BEGINS 2019
We are conducting a proof of concept that will use LiDAR (Light Detection and Ranging) imagery collected using drone platforms for ongoing inspection of the City's ring dike and mapping of the City's building inventory. The first application for drone-based LiDAR technology will be for regular dike inspection. Monitoring and maintenance of this critical piece of infrastructure is one of Richmond's top priorities. While the City currently performs regular visual inspections and surveys, LiDAR mapping of the dike system will provide a significantly improved inspection record that will allow the City to directly compare the shape and profile of the dike from inspection to inspection. This form of comparison will facilitate identification of settlement and erosion to a much higher degree and will maintain an improved record of the dikes condition. Drone based LiDAR technology will also be applied to mapping the City's building inventory. This information will be useful from a City planning perspective, improving staff's ability to model the impacts of current and future developments on sight lines, shading, etc. Post disaster, drone-based LiDAR imagery will be utilized to identify and catalogue physical building damage across the City, allowing decision makers to better apply available post disaster resources.	
Advisors	BC Institute of Technology Aerospace

PRIORITIZED POST-EARTHQUAKE RESPONSE	BEGINS 2019
We are collaborating with EMBC to conduct a proof-of-concept to implement Prioritized Post-earthquake Response (PPR) sensors and system. This system monitors and provides real-time information on the performance of critical facilities in the event of an earthquake and helps response agencies with decision making in post earthquake damage assessment and emergency response. The system will also provide pre-earthquake warnings. The project includes the installation of 10 sensors across the City on municipal and Provincial assets. The information will be shared between Richmond and the Province as well as other interested stakeholders.	
Advisors	EMBC , Ministry of Transportation and Infrastructure

4.9 RISKS AND MITIGATION

Table 4.9 Technology Risk and Mitigation

RISK	DESCRIPTION	MITIGATION
Technology architecture lacks flexibility	Ability of the architecture to support updates, changes in technology or functional requirements.	Modular architecture with non-proprietary, multi-vendor components.
Technology architecture is infeasible	The architecture is impossible to implement, excessively costly or doesn't support the requirements.	Ensure architecture and technology adheres to best practice and industry accepted standards; regular project reviews to ensure technology continues to meet project requirements and is within budget.
Technology components are not fit for purpose	The technology does not meet required functionality or is poor quality.	Regular project reviews to ensure technology continues to meet project requirements; pilot technology before implementation
Technology components are not interoperable	Technology components are not integrated or compatible.	Modular architecture; ensure architecture and technology adheres to best practice and industry accepted standards.
Technology components are not extensible	Technology components cannot be updated as technology evolves.	Modular architecture with non-proprietary, multi-vendor components.
Lack of resources	Ability of existing or future staff to provide technical support.	Ensure technology resources have a pro-technology mindset (existing and future employees/vendors; document all processes).

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GOVERNANCE

The Smart Cities Challenge has been a journey of exploration and discovery for the City of Richmond. Multiple interrelated projects and the powerful collaborations with advisors have created a complex dynamic of challenges and opportunities. To address this complexity, one of the first priorities to address our Smart Cities Challenge was to implement a robust Governance Structure to oversee and manage project planning and implementation, project risks, and advisor/stakeholder relationships.

5.1 GOVERNANCE STRUCTURE

Our Governance Structure has and will continue to ensure that our projects remain aligned to our Smart Cities vision, that we continue to make progress to achieve our outcomes, and that we maximize the return on the investment. Our Governance Structure is aligned to our Smart Cities Organization Structure (refer to Chart 3.1 Governance Structure in Chapter 3).

Table 5.1 Governance Roles and Responsibilities

GOVERNANCE GROUP	RESPONSIBILITY
City Council	Overall oversight of the program and budget spending.
CAO and Senior Management Team	Approve material going to Council and advise on progress and requirements, support the Project Office with resourcing, risk mitigation and issues resolution.
Project Office	Lead and direct program management, ensure that the program is performing according to plan and that the program remains aligned to the Smart Cities outcomes, provide guidance and support to Project Leads, approve final project deliverables, approve risk mitigation strategies and actions, approve all major deliverables associated with major milestones, report program achievement, issues risks and status, and act as spokesperson for the Smart Cities projects.
Advisory Committee	Provide technical and strategic advice to the Project Office, provide guidance and direction on data sharing and privacy, and provide advice on political and legislative issues.
Project Leads	Oversee and direct the activities of internal and external resources assigned to the project, promote the program vision and objectives, provide project reports to the Project Office, implement risk mitigation strategy and actions, ensure overall project process and deliverable quality, serve as the central point of communication and coordination for the project, ensure timely communication with the program management and key external stakeholders, direct development of project documentation and report project achievements, issues and status to Project Office.
Individual Project Team Members	Progress project scope items and act as Smart Cities leaders within the City.
Horizontal Stream Project Teams	Ensure consistency and adherence to shared standards, specifications and expectations with regards to Resident Engagement, Data Privacy, Integration, and Healthy & Resilient Communities.

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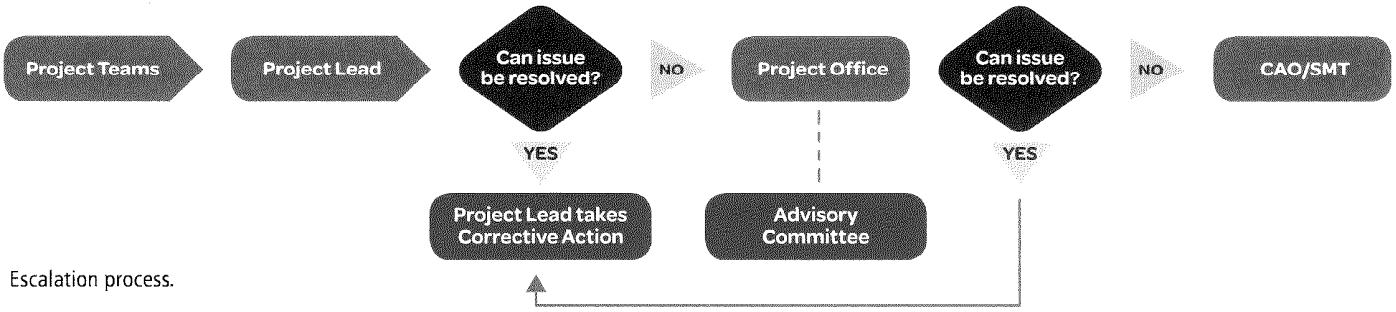
5.2 ISSUE AND ESCALATION PROCESS

We have a process in place for the escalation of issues related to project objectives, resource conflicts and issues, roles and responsibility concerns, scope disagreements, stakeholder issues and any other concerns affecting project progress. Refer to Appendix 5.2 for an Issues Log template.



Escalation process.

5.3 APPROVAL AND REPORTING PROCESSES

Project approval and reporting strategies support our governance structure by ensuring information is presented in a consistent and consumable manner and that the necessary information is made available to the right level of the organization at the right time to support decision making, allocation of resources and intervention, when required.

For details on the approval, monitoring and reporting requirements of our Smart Cities projects please refer to Chapter 3.

5.4 PROJECT ADVISORS

Our advisors and partners are arguably the most valuable asset to help us realize our Smart Cities outcomes. We are proud of the coalition of more than 25 organizations that we have built during the Finalist Phase of this Challenge. Ranging from government agencies, educational institutions, emergency response services, transportation authorities, telecom companies, and technology providers, each partner has signed onto our vision and is committed to supporting our projects, our outcomes and the Smart Cities principles of Openness, Integration, Transferability and Collaboration.

Letters of support are provided in Appendix 1.4.

Our advisors will continue to be engaged through implementation and into sustainment. Refer to Chapter 1 for a list of our Advisors, the projects they are involved in and the role they are playing. They are committed to the successful implementation of our Smart Cities projects and are supporting us in a number of different ways, including:

- Project planning and implementation with expertise, experience and resources;
- Strategic alignment of internal initiatives to support the City's Smart Cities projects outcomes;
- Leading or participating in proof of concepts to inform the implementation of our projects; and
- Sharing data, aligning processes and coordinating operations to support optimized emergency response and service delivery.

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5.4.1 INTEGRATED ADVISOR PLANNING

Comprehensive data governance structures, sharing agreements and protocols will establish a data sharing consortium enabled by user agreements, which will provide each advisor the ability to seamlessly access the same data and benefit from collective information and communication.

Shared Data Repository: The advisors are committed to finding a solution for sharing real time and historical data in order to perform analytics to understand trends and predict risk.

Creating Data Commons: The Province of BC has committed to developing a Data Commons for key risk areas. Data Commons is web space provided in specific areas to support educational resources, research projects, communities, partners, and initiatives. The collection of sites will be maintained and updated by members of the specific Data Commons community and allow for access using a sign-on process.

The BCIT Data Commons example can be found here https://commons.bcit.ca/sites-on-commons/.

To facilitate further research and a platform to share information, Richmond and its partners, including the Provincial Government, will facilitate the governance to create Data Commons in the following risk areas:

1. Early detection and mitigation of flooding;
2. Early detection and mitigation of seismic events;
3. Early detection and mitigation of toxic spills in the riparian zones; and
4. Improved road safety and reduction of traffic collisions due to weather conditions using variable highway speeds.

Integrated Emergency Plans: Government advisors will work toward integrated plans for emergency response. This will improve communication and response for emergency operations and shared data required to implement as is seen in the Disaster Case Study included in Appendix 1.1.

5.4.2 STAKEHOLDER ROLES AND CAPACITY

A number of our advisors have ongoing parallel initiatives or projects that are related to and support the outcomes of our Smart Cities projects and any of these projects could integrate into the Intelligent Operations Hub. Projects are being coordinated with the Project Office and will amplify the impact of our projects. We are developing data sharing agreements, Data Commons for government partners and processes that will govern the exchange, use and security of data between advisors. For additional information on our projects, please refer to Appendix 5.3 and 5.4.

Table 5.4.2 Stakeholder Roles and Capacity

COMPANY/ ADVISOR	PROFILE/CAPACITY/READINESS	POTENTIAL IMPLEMENTATION PHASE INVOLVEMENT
AMERESCO	Ameresco, Inc. is a leading independent provider of comprehensive energy efficiency and renewable energy solutions for facilities throughout North America and the United Kingdom, delivering long-term value through innovative systems, strategies and technologies. https://www.ameresco.com/	• Procurement • Smart Streets, sustainable transportation and resilient power • Business case development future project funding
Aware360	Aware360's cloud-based and mobile solutions provide real time information to manage people and assets anywhere in the world — Device agnostic, agile API, two-way communications and connectivity. https://aware360.com/	• Procurement involvement
BC Hydro	BC Hydro is a Crown corporation, owned by the government and people of British Columbia. They generate reliable, affordable electricity. https://www.bchydro.com/index.html	• Data Commons partner • Integrated Emergency Plans • Data Sharing agreement • Advisory committee

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Table 5.4.2 Stakeholder Roles and Capacity, continued

COMPANY/ ADVISOR	PROFILE/CAPACITY/READINESS	POTENTIAL IMPLEMENTATION PHASE INVOLVEMENT
BCIT Aerospace	BCIT is one of British Columbia's largest post-secondary institutions with more than 48,000 students enrolled annually (16,600 full-time, 31,600 part-time). They offer career training for Applied and Natural Sciences, Business and Media, Computing and Information Technology, Engineering, Health Sciences and Trades. https://www.bcit.ca/about/	• Drone program • Advisory Committee • Data Commons partner • Superclusters Project Team
CORIX	Corix is a leader in the implementation of sustainable water, wastewater, and energy utility infrastructure solutions for small to medium-sized communities across North America. Head offices located in Vancouver, BC and Northbrook, IL. https://www.corix.com/	• Performance monitoring LIEC
E-Comm 9-1-1	E-Comm is the first point of contact for 9-1-1 callers in 25 regional districts in British Columbia, handling approximately 1.6 million 9-1-1 calls a year (99 per cent of B.C.'s 9-1-1 call volume). https://www.ecomm911.ca/	• Data sharing agreement • Integrated emergency plans
Government of Canada – Ocean Networks Canada	The University of Victoria's Ocean Networks Canada monitors the west and east coasts of Canada and the Arctic to continuously deliver data in real-time for scientific research that helps communities, governments and industry make informed decisions about our future. http://www.oceannetworks.ca/	• Advisory Committee • Early warning notification • Superclusters Project Team • Data Commons Agreements
Kwantlen Polytechnic University (KPU)	Established in 1981, Kwantlen Polytechnic University has four campuses located in the Metro Vancouver region of British Columbia. KPU offers bachelor's degrees, associate degrees, diplomas, certificates and citations in more than 120 programs. Almost 20,000 students annually attend courses at KPU campuses. http://www.kpu.ca/	• Emergency Non-verbal communication • Early Warning System Pilot Project Liquefaction • Design of the Intelligent Operations Hub
MDA	MDA develops and delivers advanced surveillance and intelligence solutions, defence and maritime systems, radar geospatial imagery, space robotics, satellite antennas, and communication subsystems. https://mdacorporation.com/	• Advisory Committee • Data sharing agreements • Superclusters Initiative Lead
Musqueam Indian Band	Musqueam are traditional **hən̓q̓əmin̓əm** speaking people. They are a strong, growing community of over 1,300 members based on a small portion of their traditional territory, known as the Musqueam Indian Reserve, located south of Marine Drive near the mouth of the Fraser River. https://www.musqueam.bc.ca/	• Advisory Committee • Data Sharing agreements including Early Warning Notifications
Province of BC / Emergency Preparedness, Response and Recovery	Emergency Management BC (EMBC) is the province's lead coordinating agency for all emergency management activities, including planning, training, testing and exercising. https://www2.gov.bc.ca/gov/content/safety/emergency-preparedness-response-recovery/emergency-management-bc	• Early Warning System Notification • Prioritized-Post Earthquake Response (PPR) • Advisory Committee • Superclusters Project Team

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Table 5.4.2 Stakeholder Roles and Capacity, continued

COMPANY/ ADVISOR	PROFILE/CAPACITY/READINESS	POTENTIAL IMPLEMENTATION PHASE INVOLVEMENT
Province of BC – Ministry of Jobs, Trade and Technology	Data BC: https://data.gov.bc.ca/ Provincial Emergency Management Technology Cluster; Includes Lightship and IBM https://www.lightshipworks.com/ https://www.ibm.com/ca-en	• Intelligent Field Operations Digital Platform • Advisory Committee • Superclusters Project Team • Data Sharing
Province of BC Ministry of Transportation and Infrastructure	Traffic Data program: http://www.th.gov.bc.ca/trafficData/index.html Seismic sensors in Richmond and across BC http://www.bcsims.ca/	• Structural Health Monitoring (SHM) • Strong Motion (SM) • Data Sharing Agreement • Data Commons partner
Richmond Hospital (Stakeholder)	Richmond Hospital part of Vancouver Coastal Health http://www.vch.ca/locations-services/result?res_id=1	• Structural Health Monitoring (SHM) • Strong Motion (SM) • Data Sharing • Integrated Emergency Plans
Richmond School District No. 38	Richmond School District https://www.sd38.bc.ca/Pages/default.aspx	• Integrated Emergency Plans • Structural Health Monitoring (SHM) • Strong Motion (SM) • Data Sharing
Government of Canada RCMP	The Royal Canadian Mounted Police is the federal and national police force of Canada. The RCMP provides law enforcement at the federal level.	• Project Team Smart Streets • Integrated Emergency Plans
Sierra Wireless	Sierra Wireless is a multinational wireless communications equipment designer and manufacturer headquartered in Richmond, British Columbia, Canada. It maintains offices and operations in California, France, Guangdong and Hong Kong. https://www.sierrawireless.com/	• Advisory Committee • Procurement • Wireless / Sensor connectivity
SNC Lavalin	SNC-Lavalin Group Inc. is a Montreal-based company that provides engineering, procurement, and construction services in various industries including; mining and metallurgy, oil and gas, environment and water, infrastructure, and clean power. http://www.snclavalin.com/en	• Data Sharing Canada Line
TELUS	TELUS Corporation is a Canadian national telecommunications company that provides a wide range of telecommunications products and services including internet access, voice, entertainment, healthcare, video, and IPTV television. https://www.telus.com/en/	• Advisory Committee • Fibre Optics / Pure Fibre Network • LTE / 5G
TIBCO	TIBCO Software Inc. is an American company that provides integration, analytics and event-processing software for companies to use on-premises or as part of cloud computing environments. The software manages information, decisions, processes and applications for over 10,000 customers. www.tibco.com	• Advisory Committee • Event Processing / Middleware • Machine Learning Analytics • Traffic Proof of Concept • Procurement

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Table 5.4.2 Stakeholder Roles and Capacity, continued

COMPANY/ ADVISOR	PROFILE/CAPACITY/READINESS	POTENTIAL IMPLEMENTATION PHASE INVOLVEMENT
TransLink	With a public transit service area spanning more than 1,800 square kilometres, they provide transportation for the needs of Metro Vancouver residents and businesses. In partnership with municipal partners, they fund and deliver the Major Road Network and a network of bicycle lanes that serve the region. https://www.translink.ca/About-Us.aspx	• Advisory Committee • Superclusters Project Team • Electrification of Richmond for Buses and Trucks • Bike Storage Facility • Data Sharing Agreement • Integrated Emergency
Transoft Solutions	Transoft Solutions develops and supports innovative and timesaving CAD-based software for engineers, architects, and drafters for civil and infrastructure design and planning needs. Transoft's products have become the de facto standard of the departments of transportation of many state and national agencies throughout the world. www.transoftsolutions.com	• Procurement Process
University of Victoria	See Government of Canada — Ocean Networks Canada	• Advisory Committee • Early warning notification • Superclusters Project Team
UrbanLogiq	UrbanLogiq aggregates, automates, adds, and analyzes diverse data sets to give governments a unified view of Urban Intelligence. Achieving the compounding value of data is vital to intimately understanding the current behaviour of communities to both improve service delivery and plan for greater resiliency and sustainability. https://www.urbanlogiq.com/	• Advisory Committee • Superclusters Project Team • Integrated Emergency Plans • Data Sharing Agreement • Data Commons partner • EV Charging for Trucks Pilot
Vancouver Fraser Port Authority	The Port of Vancouver is Canada's largest port. The Vancouver Fraser Port Authority's role is to responsibly facilitate Canada's trade through the port. They work together with port terminals and tenants to ensure the efficient and reliable movement of goods and passengers, integrating environmental, social and economic sustainability initiatives into all areas of port operations. https://www.portvancouver.com/about-us/	• Advisory Committee • Superclusters Project Team • Integrated Emergency Plans • Data Sharing Agreement • Data Commons partner • EV Charging for Trucks Pilot
Vancouver International Airport Authority	Canada's second busiest airport, YVR served 25.9 million passengers in 2018. Fifty-six airlines serve YVR, connecting people and businesses to more than 127 non-stop destinations worldwide. YVR is not only a transportation hub, it is an important economic generator in our region. http://www.yvr.ca/en/about-yvr/who-we-are	• Advisory Committee • Superclusters Project Team • Data Sharing Agreement • Data Commons contributor
Westcoast Sightseeing	https://westcoastsightseeing.com/	• Project Team 1.2 Sustainable Transportation

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5.5 ADVISOR GOVERNANCE

The vast majority of our advisors are members of our Project Team Advisory Committee. They have provided input into and advised on individual projects, processes and technology we are implementing. They meet on a monthly basis and are guided by a Terms of Reference summarized below:

5.5.1 TERMS OF REFERENCE

Vision

To contribute to a successful business case/final proposal to secure $10 million in the Government of Canada's Smart Cities Challenge and facilitate innovative solutions that enhance the quality of life for the Richmond community and minimize impacts from major disasters.

Objectives

1. Provide advice on the business case/final proposal phase of the Smart Cities Challenge submission to the Government of Canada.
2. Ensure the best and most up to date technology solutions are integrated into the project.
3. Create strong and effective intergovernmental relationships to plan projects jointly.
4. Facilitate opportunities for private and academic sector involvement in the project to create innovative solutions.
5. Create strong networks to expand the resources available and collaboration for the project.
6. Support community engagement through the process.
7. Showcase leadership and innovation to other cities across Canada.
8. Ensure a Smart City approach is used to deliver the project.

Scope and Purpose

a. Align the project with government and organizational strategy.
b. Recommend the best use of appropriate assets and resources.
c. Ensure the project is using open and/or standards based technologies.
d. Encourage project collaboration.
e. Recommend the resolution to strategic level issues and risks.
f. Advise on the direction of the business case/final proposal submission.
g. Ensure the private sector is involved in the project at key times.
h. Ensure the outcomes are aligned with citizen and community priorities.
i. Recommend changes to the project with a high impact on timelines and budget.
j. Assess project progress.
k. Provide advice and guidance on business issues facing the project.
l. Use influence and authority to assist the project in achieving its outcomes.
m. Recommend final project deliverables.

Membership

The membership of the Smart Cities Challenge Advisory Committee is:

- City of Richmond
- Ameresco
- Aware 360
- BC Hydro
- British Columbia Institute of Technology
- Kwantlen Polytechnic University
- MDA
- Metro Vancouver
- Musqueam Indian Band
- Ocean's Network Canada
- SNC Lavalin
- Sierra Wireless
- TELUS
- TIBCO
- The Province of British Columbia – Emergency Management BC
- TransLink
- Transoft
- UrbanLogiq
- Vancouver Fraser Port Authority
- Vancouver International Airport Authority

Term

The term of the Advisory Committee will complete upon the submission of the business case/final proposal to the Government of Canada in March 2019. Based on outcomes, the Committee may extend into the implementation phase.

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Advisory Committee members discuss our Smart Cities Challenge proposal

5.6 RISKS AND MITIGATIONS

The table below identifies the risks and mitigation specific to Smart Cities Governance:

Table 5.6 Smart Cities Governance Risks and Mitigation

RISK	DESCRIPTION	MITIGATION
Stakeholders are not aligned on Project objectives	Project context is unclear and governance of the project cannot ensure that the project is focused on the outcomes.	• Internal alignment workshop with the project office, theme chairs and team leads • Advisor alignment workshop • Regular project reviews to ensure continuous
Unclear accountabilities	Resources are unclear what their responsibilities and authority is and what needs to be referred to a high level of authority within the chain.	• Roles and responsibilities clearly communicated • Escalation process developed and clearly communicated • Regular team meetings to ensure project issues are communicated and addressed in a timely manner
Poor reporting	No periodic reporting on progress.	• Develop robust reporting process and communicate it clearly
Lack of independent assurance	Independent check of the structures and processes to review whether the objectives will be met are not in place.	• Establish independent assurance procedures
Lack of buy-in from project advisors	Advisors are not committed to the project and their roles and responsibilities.	• Advisor alignment workshop • Regular engagement and communication with advisors • Collaboration with advisors on projects

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ENGAGEMENT

We have created a comprehensive stakeholder identification, management and engagement plan and have used this as the basis of our interactions with our project advisors, our residents and other internal and external stakeholders. The core elements of our plan are detailed below.

6.1 ENGAGEMENT OBJECTIVES

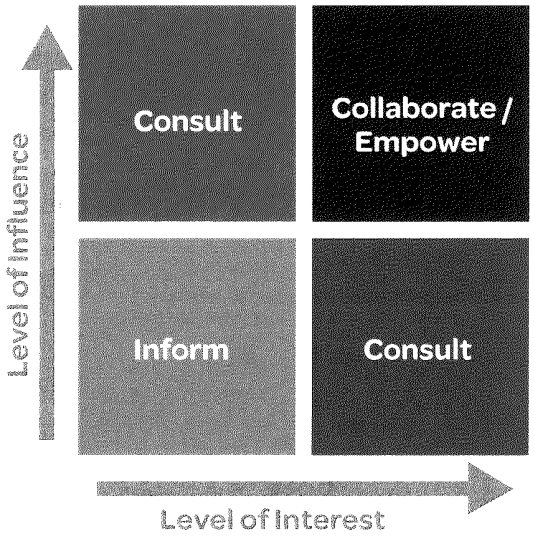
Our engagement objectives are as follows:

1. Engage, gain acceptance from and onboard residents and other project stakeholders to ensure ongoing alignment between our outcomes and their priorities;
2. Encourage broad and ongoing participation in engagement activities; and
3. Identify and incorporate engagement tools that are inclusive and reach a diverse audience.

6.2 OUR AUDIENCE

Our aim is to engage with all residents and form meaningful and productive partnerships with key stakeholders. We have identified the following groups for our engagement strategy:

- Richmond residents
- Community stakeholders and partners
- Community service agencies
- Project partners and advisors (current and potential)
- Richmond businesses and their employees
- Richmond City Council
- City staff
- Municipalities, other levels of government and other entities interested in replicating what we are doing
- Media (local, national and international)



Stakeholder engagement approach.

6.3 ENGAGEMENT APPROACH AND TOOLS

The Smart Cities Challenge process has established a platform for creating meaningful conversations with our residents, stakeholders, the business sector and community partners. We have adopted a multi-channel communication approach, targeting a variety of different communication tools that have different audiences.

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6.3 ENGAGEMENT APPROACH AND TOOLS

Table 6.3 Engagement Tools

We have chosen communication tools that allow us to inform and consult the community and key stakeholders from the planning stage of our projects through to implementation. Our communication tools are designed to be as inclusive and accessible as possible and ensure we are reaching all residents.

STAGE	APPROACH	CHANNELS
Inform	Provide consistent information to residents, stakeholders and City staff.	• News releases • Newspaper ads • Project website — smartcity.richmond.ca • Media outreach and resulting coverage • Pop-up events • Targeted communications through existing community networks and project partners • Social media • Smart Cities video • City of Richmond Intranet and digital elevator screens • Posters and printed promotional materials
Consult	Provide information, obtain feedback on the project's goals, approach and outcomes and inform on how it influenced the project outcomes.	• Surveys on LetsTalkRichmond.ca • Paper surveys • Meetings with stakeholder groups • Pop-up events • Displays at City events • Polls on project website — smartcity.richmond.ca
Involve	Work with stakeholders and City staff to ensure that their feedback is reflected in alternatives developed.	• Focus Groups • Project Team Meetings
Collaborate	Partner with Stakeholders in the development of alternatives, approaches and decision making.	• Alignment Workshops • Partner Workshops • Advisory Workshops Committee • Pilot Projects
Empower	Place final decision-making in the hands of the stakeholder.	• Joint planning • Advisory Committee

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6.3 ENGAGEMENT APPROACH AND TOOLS

Our strategy is designed to communicate the complex nature of the Challenge and our response to residents and stakeholders. Materials are written in clear, plain language and provided in multiple languages as appropriate. In order to maximize levels of participation, our communication materials are designed to illustrate clearly to help our community understand how our projects directly impact their lives.

We have placed emphasis on online engagement to give our citizens the flexibility to contribute anytime and wherever they want. We are utilizing a number of interactive and highly visual digital engagement tools, such as LetsTalkRichmond.ca, which provides the community with an interactive engagement platform. We have also incorporated feedback tools in our Smart Cities Challenge Project website, smartcity.richmond.ca to encourage active engagement and return visits.

We continue to recognize the importance of other methods of communications in order to avoid excluding residents and stakeholders without the internet and those with low levels of technical literacy. We are also working with our Privacy Officer to address privacy concerns in regard to online activity in order to encourage participation. Effective tools included a map of existing sensors, photobooth props and 'a day in the life' boards.

6.4 SUBMISSION PHASE ENGAGEMENT AND INSIGHTS

Our original Smart Cities Challenge focus areas and Challenge Statement were developed in response to significant public, stakeholder and staff engagement. This included stakeholder meetings, business and academic sector workshops, a dedicated project website, best practice research, a social media campaign and public engagement.

We asked residents in March and April of 2018 to vote on categories identified by the Smart Cities Challenge to focus on for our challenge statement and to share their ideas under each of the categories.

The majority of respondents chose, in this order:

1. Safety and Security
2. Mobility

Feedback from local technology businesses, representatives from the development and construction sector, local public agencies and the academic sector confirmed the approach to move forward with these focus areas. Many of the ideas generated through this initial engagement process were incorporated into the proposal that led to Richmond becoming one of 10 finalists in the Smart Cities Challenge.

6.5 FINALIST PHASE ENGAGEMENT PLAN

As we entered the Finalist Phase of the Challenge, we developed an engagement plan that built on the engagement activities that informed our initial submission and took advantage of synergies with other ongoing City engagement processes. Refer to Finalist Phase Engagement Plan table in Appendix 6.1.

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6.6 ENGAGEMENT HIGHLIGHTS

A. ADVISORY COMMITTEE

Many of the stakeholders engaged through the submission phase of the Challenge, including representatives from government agencies, technology companies and the academic sector, accepted the opportunity to join us on our Smart Cities Challenge journey. The contributions of the Advisory Committee, through monthly meetings, participation on various project teams, and introductions to new technology ideas and potential project partners, has been instrumental to the evolution of our outcomes and the innovative approaches being proposed to achieve them. A listing of Advisory Committee members can be found in Chapter 1.

B. BUSINESS SECTOR ENGAGEMENT

Engagement of local businesses, with a focus on the technology sector, has been a priority from the outset of this project. Feedback from a Business Stakeholder Workshop held in spring 2018 was invaluable in informing the direction of our original submission. Many of the technology companies invited to that workshop are represented on our Advisory Committee, along with government agencies and academic sector stakeholders. Since then, we have continued to engage the technology sector in a variety of ways:

- A Technology Workshop was held in November 2018.
- An RFEOI was distributed on BC Bid and shared with local technology companies requesting information from the market to inform our projects and interactions with the private sector.
- Richmond's participation in the Smart Cities Challenge has been promoted at the political level, through presentations at a number of Richmond Chamber of Commerce events, including the Mayor's Annual Address.

Engagement of the business sector has resulted in the development of innovative approaches to achieve our outcomes, and agreements to contribute in the pilot projects described in Chapter 4. Richmond continues to reach out to the business sector through presentations including the 2019 BC Tech Summit to outline opportunity for procurement, and the KPMG Roadshow to showcase opportunities for Smart Cities engagement.

C. SMART CITIES IDEAS FAIR

Co-hosted by the City of Richmond and Kwantlen Polytechnic University (KPU), the Smart Cities Ideas Fair, which took place on January 17, 2019 at KPU's Richmond campus, featured a variety of displays, demonstrations and hands-on activities. The Smart Cities Challenge Street Team participated, along with a number of City departments who shared information about projects that are foundational to our Smart Cities Challenge. MDA, a local technology company and member of the Smart Cities Challenge Advisory Committee, displayed some of the work they are undertaking with satellite imaging. KPU presented a number of projects from their faculty and students in progress.

D. SMART CITIES CHALLENGE STREET TEAM

A team of staff and volunteers engaged the public through pop-up engagement activities at accessible locations throughout the city intentionally identified to reach a range of demographics. At these events, paper surveys were available in English and traditional Chinese, and for the first time, the Street Team members were armed with iPads to encourage passersby to complete surveys or quick polls online. The Google Translate function was added to the LetsTalkRichmond.ca platform as well as the Smartcity.richmond.ca website, to provide even greater access to participation for our diverse community.

An event highlight was the Richmond Resilient Partners Community Engagement Event, in collaboration with the City's Emergency Programs, Richmond Fire-Rescue and London Drugs. This event launched the current phase of communication materials, with simple messaging and graphics to communicate the essence of our complex proposal into "language" that people with limited technical literacy and/or communication barriers would be better able to understand. For examples refer to Appendix 6.2.

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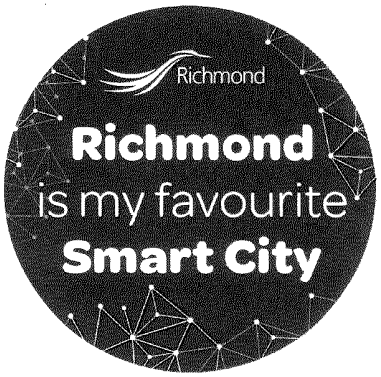
6.7 ENGAGEMENT PLAN — NEXT STEPS

The following are key steps to continue our engagement momentum for the Smart Cities Challenge:

1. Implement "Richmond is my favourite Smart City" campaign with:
   - Smart Cities Challenge Street Team — pop-ups
   - Staff engagement
   - Social media campaign
2. Continue our partner social media campaign to solicit ideas and understanding;
3. Conduct focus groups: Evaluation of multilingual translation tools — Google Translate and Amazon Translate;
4. Continue co-promotion of emergency preparedness initiatives;
5. Promote the new features of MyRichmond;
6. Form a working group to advise on the development/adoption of communication tools (for-day to-day and emergency use) to bridge language barriers, mitigate issues of technology literacy and ensure social equity in City communications;
7. Implement public and stakeholder engagement activities as identified within individual Project Implementation Plans (see Chapter 3 for more information);
8. Present to the KPMG Smart Communities Roadshow; and
9. Present to the BC Tech Summit in March 2019.

Richmond is my favourite Smart City campaign button.



6.8 DIVERSITY AND INCLUSION

Richmond is the most diverse city in Canada. We are a vibrant, rapidly developing city with a strong economy that has attracted thousands from around the world. Our city is made up of a broad range of individuals and community groups with different backgrounds, cultures, needs and values. We recognize the importance of reflecting this cultural diversity in our workforce and in our engagement efforts in order to effectively serve the diverse needs of our community.

We have designed our engagement process to minimize barriers and taken the following measures to engage with all members of our diverse community:

- Created a multi-channel communication approach, targeting a variety of different communication channels that tend to have different audiences. This involves using both digital and non-digital channels to capture people with different levels of technology literacy;
- Provide a wide range of engagement opportunities including smaller gatherings that enable greater participation from people with communication barriers. We are also using meeting locations that are accessible for people with disabilities or mobility issues;
- Communicate consistently and frequently through trusted networks as well as new platforms. This involves working with existing community networks as well as developing new networks as they have emerged through the development of our Smart Cities Challenge proposal;
- Incorporated Google Translate into our Smart Cities Challenge project website to bridge language barriers;
- Use interpreters and multilingual volunteers at public events;

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- Collaborate with the Musqueam Indian Band to ensure our projects align with their needs and that they are engaged throughout the process and benefit from our outcomes;
- Committed to ensuring our procurement process create sufficient opportunities for businesses of all sizes. This involved employing right-sizing principles in procurement planning and providing greater transparency on how suppliers should respond to our procurements; and
- Used technology tools such as iPads at events to answer survey questions and review project information with participants to allow for immediate interpretation.

To ensure that diversity and inclusion considerations were incorporated into the engagement plan as well as the projects themselves, a number of key staff from the City's Community Social Development department with expertise in social development, child care and inclusion participated on project teams and provided insightful input as required. Including staff from across the City helped to break down silos to achieve City-wide buy-in and support for our Smart Cities Projects. It also opened the door for engagement with two Council-appointed committees, the Richmond Intercultural Advisory Committee (RIAC) and the Richmond Community Services Advisory Committee (RCSAC). RIAC is comprised of 18 citizen appointees with a mandate to enhance intercultural harmony and strengthen intercultural co-operation in Richmond. The RCSAC is comprised of two citizen appointees and thirty government, community, and agency representatives (complete listing of organizations represented can be viewed at https://www.rcsac.ca/members) with a mandate to encourage and promote social policies and community services.

Our Smart Cities Challenge Team was invited to take part in the fourth annual City of Richmond Diversity Symposium in November 2018, which focused on innovative collaboration and partnerships to foster inclusion. Participants expressed a great deal of interest in the importance of bridging communication barriers both in day-to-day operations and in emergency situations.

6.9 FEEDBACK AND REPORTING

We are committed to providing adequate and timely information and feedback to our stakeholders on the results of our engagement, project updates and key decisions. We will provide the following information back to stakeholders and community members:

- How participant input has been used to inform the decision-making process;
- The next steps of project implementation and updates on progress; and
- Details about future opportunities for input.

We are utilizing the following communication tools to provide this feedback:

- Let's Talk Richmond website;
- The project website smartcity.richmond.ca;
- Social media; and
- Open houses and pop-up engagement opportunities.

As well as reporting back to our stakeholders and community members we will also provide regular engagement reports to our Advisory Committee and City Council.

6.10 ISSUES MANAGEMENT

Throughout engagement, we are continuously identifying and monitoring issues that arise. We have a dedicated issues log to record issues, determine their impact, determine mitigation strategies and track the status of the issue resolution. We follow the following issues management process:

Step 1: Identify issues
Step 2: Log issue
Step 4: Identify mitigation strategy
Step 3: Assess engagement impact
Step 5: Monitor

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Based on our interactions we have experienced and anticipate the following reactions as our projects progress:

Table 6.10 Engagement Issues Management

ISSUE	MITIGATION	ENGAGEMENT IMPACT
EXPERIENCED REACTIONS		
Privacy Concern	• No Personal Data	• Personal data will be protected and only used for the purposes for which permission has been granted
Security Concern	• Robust security measures using best practice	• Personal data will be protected and only used for the purposes for which permission has been granted
Language barriers	• Integrate automated translation tools on City online platforms • Provide access to a multilingual call centre for staff and the public • Ensure multilingual (in particular Cantonese-speaking) volunteers at community events/open houses to mitigate any shortfalls identified through our upcoming focus groups to solicit feedback on multilingual translation tools	• Bridging language barriers • Provide enhanced customer service • Automated translation tools provide real-time translation into multiple languages – it is unlikely we would have volunteers who can speak every required language at any one event
Lack of technical literacy/limited access to technology	• Targeted outreach to isolated populations • Engage relevant stakeholder organizations to connect with isolated residents • Incorporate traditional communication tools such as paper surveys and newspaper advertising into engagement plans • Use digital message boards in the public realm to communicate critical messaging	• Mitigate barriers to participation in consultation opportunities • Bridging communication barriers • Bridging connections between relevant stakeholder organizations and isolated residents
ANTICIPATED REACTIONS		
Technology and digital platforms are too complicated	• User friendly design • Education and training	• Walk-through of technology and digital platforms • Technology literacy workshops • Clear communication in future engagement
Technology will become obsolete in future	• Best practice standards that can be updated as technology progresses • "Plug and play" components that can be removed or updated without affecting other components in the system • Non-specific product trademarks or brands	• Clear communication in future engagement

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6.11 RISKS AND MITIGATION

The table below identifies the risks and mitigation specific to Smart Cities engagement:

Table 6.11 Engagement Risks and Mitigation

RISK	DESCRIPTION	MITIGATION
Differing capacity of stakeholders	Stakeholders have different levels of skills and experience in engaging with government. This can affect their ability to fully participate in an initiative, as well as the quality of the information they provide.	We will work with stakeholders to build their capacity to contribute, or offer modified or different models of engagement.
Insufficient resources	The absence of the right skills can hinder collaboration across organizational boundaries and make it hard to identify issues and opportunities. This can result in damaged relationships between government and stakeholders, and poor-quality advice and information.	During this planning stage, we have identified the skills available and skills required at subsequent stages and have explored options to develop skills and/or engage external expertise.
Misalignment between project and stakeholder expectations	There are a significant number of stakeholders with a range of expectations and interests regarding each project. There is a risk of a mismatch between stakeholder expectations and the project plans.	Communicate project plans, progress, impacts and benefits to community members to ensure they are fully informed about the Project and that the Project team members understand their interests and concerns.
Stakeholders become disengaged	Stakeholders ignore project communications and do not participate in engagement activities.	Engage early; ensure projects remain aligned with stakeholder needs; multi-channel engagement to capture wide audience; easy to access engagement tools.
Stakeholders fail to support the project	Stakeholders have a negative attitude towards the project and are not invested in its success.	Engage early; ensure projects remain aligned with stakeholder needs; establish and maintain strong relationships with stakeholders.
Inability to engage with certain community groups	Certain community groups are not engaged and their feedback and input is not incorporated.	Multi-channel engagement; multilingual communication tools; engagement tools are accessible to people with disabilities; active engagement with First Nation communities; outreach to vulnerable populations.

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DATA AND PRIVACY

We are fully committed to protecting the privacy of our residents and are aware of the many complex challenges cities across Canada face in this regard. As we embark down this journey, we have made the decision to initially limit the use of personal information from the scope of our Smart Cities projects. The City has dedicated a Privacy Officer, who is already working with the BC Privacy Commissioner's Office on the Preliminary Privacy Impact Assessment ("PPIA") for our Smart Cities solutions.

While we are confident in the security-by-design and safeguards we are putting in place – we will develop all components of our Smart Cities Digital Intelligence and fully test and confirm our data environment, flows and security. Only then will we safely introduce additional personal information for the benefit of our residents and in accordance with the Personal Information Protection and Electronic Documents Act ("PIPEDA") and the British Columbia's Freedom of Information and Protection of Privacy Act.

We have developed a data management plan based on leading practice that leverages the existing City data and privacy strategies – including completing a PIA for the MyRichmond component of our project. Our approach to data and privacy has been built on the following three pillars:

1. Build trust between ourselves, our advisors and our residents through ongoing engagement, honesty and transparency – refer to chapter 6 for additional details.
2. Implement sound governance and data management principles to ensure we optimize the use of data to ensure value, security and privacy.
3. Leverage technology to minimize the risks associated with data.

7.1 DATA MANAGEMENT

We have adopted data and privacy principles that optimize the value of integrated data while ensuring the security and privacy of sensitive data. The table below demonstrates this alignment:

Table 7.1 Data Management Alignment

PRINCIPLE	OUR ALIGNMENT
Governance	A strong governance structure has been established for our overall Smart Cities projects, specifically around data privacy (refer to Chapter 3). The governance structure will ensure the independence of our Privacy function from our project function. The Privacy function will report directly to the City's Privacy Officer who will ensure that all privacy and security requirements are being met. This eliminates potential conflict-of-interest within the project structure and ensures a consistent check and balance regarding data privacy and security. We have enlisted an internal privacy champion and have procured external expertise to advise on privacy matters. We are working with the Province of BC's Chief Information Officer for advice and best practices and have engaged our residents from the start to ensure we continue to align with their priorities and expectations (refer to Chapter 6).

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Table 7.1 Data Management Alignment, continued

PRINCIPLE	OUR ALIGNMENT
Ownership and Control	We have been proactive in ensuring that ownership and control of data is community based and does not become a private-sector asset. All of our advisors, including private sector advisors, are committed to work with us to ensure ownership and control of data remains with the City of Richmond and other public advisors. This is best evident in the commitment included in Chapter 5 of our proposal. We have also started this conversation more widely through the issuance of our RFEOI (refer to Chapter 3). All future procurements will be designed to enable community-owned and controlled data approaches.
Consent	The City does not gather personal information without explicit and knowledgeable individual consent. Clear communication of the purpose of data collection, what data is being collected and their right to withdraw consent is always shared. Where possible customers will 'opt in' to share data to give verifiable proof of explicit consent. We will not use pre-checked boxes and we will make sure that our consent information is clearly stated and easily accessible. Individuals can quickly and easily revoke consent at any time.
Data minimization and De-identification	We have taken measures to limit the use of personal data in the scope of our Smart Cities projects. The use of personal data in large part exists within the MyRichmond scope – for which we have completed a full PIA. Identifiable data is avoided where possible which includes aggregating all data, de-identifying data as soon as possible after collection and ensuring sensor data is not combined with personal information. Where personal data needs to be stored, we have ensured that it is encrypted, limited people have access to it and it is easy for individuals to access their information and withdraw it at any time.
Accessibility	We will establish a data-sharing federation with our intergovernmental advisors to share access to networks and systems and to exchange information to mutually benefit from collective knowledge and communication channels. The data is in the form of dashboard level information. Advisors can also register to receive raw aggregated data to develop value-added services such as Online Map services. API services and data subscriptions used by these advisors will not contain personal identifiers or personal data.
Security	All personal information is stored at the City's on premise data centre, protected by our secured network infrastructure, operational procedures and policies. Security measures include: • Data transit between servers and clients are encrypted over the internet • The City uses a firewall to protect all internal data from the internet • Access to the data centre is granted to limited staff and is audited • Access to the server is granted to limited staff and is audited

7.2. TECHNOLOGY

To minimize the collection and storage of personal data, we are leveraging computing power at the point of collection to send analytics versus sensitive information. Rather than recording and storing images, our smart cameras will process visual information at the source and transmit benign non-personal information that is valuable to managing traffic, predicting events, and providing situational awareness.

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7.3 PRELIMINARY PRIVACY IMPACT ASSESSMENT

We have developed a Preliminary PIA inclusive of comprehensive data flow across our Smart Cities projects (refer to Confidential Annex.). Throughout the Finalist Phase we have been in contact with the Office of the Information and Privacy Commissioner for B.C. to solicit guidance and expertise. In addition, the MyRichmond web portal was previously subject to a PIA which has also been included with Confidential Annex.

7.4 DATA COLLECTION AND STORAGE

Collectively our projects combine to create a process in which data from multiple sources and entities is collected, transmitted, integrated and processed to create meaningful information that supports integrated operations, emergency response, traffic management and integrated communication. This data flow is provided with our Preliminary PIA.

7.5 COMPLIANCE

We are fully committed to protecting the privacy of our residents. Any personal information provided to us is collected, used and disclosed in accordance with the Personal Information Protection and Electronic Documents Act ("PIPEDA") and British Columbia's Freedom of Information and Protection of Privacy Act. Please refer to our Preliminary PIA for details on how we are ensuring compliance.

7.6 OPEN DATA AND DATA COMMONS

Extracting value from large volumes of data is a critical component of our Smart Cities projects and our Collect, Connect, Crunch, Communicate process. In Chapter 4 we identified the technology we are implementing to support our use of Big Data.

We are working with the Province of BC to develop a Data Commons for sharing information required for research or predictive analytics. The plan will be subject to Provincial oversight. Our data management principles identified earlier in this chapter inform our Big Data strategy and will guide the development of the data sharing agreements with our advisors.

We are committed to sharing the benefit of our Smart Cities project with others across British Columbia and Canada. We believe the multi-advisor sensor network, Intelligent Operations Hub, predictive models and integrated communication network will enable the establishment of a West Coast Emergency Hub. We will encourage all West Coast communities to join the network, benefit from the technology, processes and resources we are putting in place and in doing so amplify the benefit to all through increased reach, data availability and innovation potential.

Any API services and data subscriptions used by outside stakeholders will not contain personal identifiers or personal data. This data will be shared and governed through data sharing agreements or joint agreements with the Data Commons. Not only will this data sharing be beneficial to others within our community, we are also open to sharing non-sensitive data and insights with the public through an Open API process.

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7.7 RISKS AND MITIGATION

The table below identifies the risks and mitigation specific to Smart Cities data and privacy:

Table 7.7 Data and Privacy Risks and Mitigation

RISK	DESCRIPTION	MITIGATION
Data breach	Data breach from phishing attacks and software exploits.	Employee training on data privacy controls, limited user access to data, advanced software protection and backups. Strong cyber security that is aligned and maintained to leading practice. Provincial oversight.
Partner or Stakeholder Breach	A data breach occurs within an advisor organization.	Implement comprehensive data governance sharing agreements and protocols between our advisor networks – with agreed governance and security standards.
Insufficient data breach response	Failure to inform affected data subjects about a possible breach or data leak.	Establish a process for data breach response and provide training to key staff. Include Provincial oversight.
Insufficient de-identifying of data	Personal data is not de-identified and could potentially be linked back to individual.	Personal data limited in the scope and encryption of personal data.
Resident concerns over data privacy	Residents are unclear about what data is collected and how it is being used.	Personal data limited from the scope. Clear communication on the purpose of the data collection and how data will be collected, stored and processed. Clear communication on the benefits of the data collection. Transparent communication on consent processes and withdrawing personal information.
Non-transparent policies, terms and conditions	Outdated, inaccurate or incomplete policies and terms and conditions or conditions and policies that are too complicated. Failure to provide sufficient information on how data is collected, stored and processed.	Clear communication of data policies, dedicated data privacy resource who keeps information updated and complete. Clear communication on how data is collected, stored and processed, and why.
Collection of inessential data	Data is collected that does not serve a defined purpose.	Minimize data collection to required data only. Clear identification and defines purpose of data collection.
Collection of personal data without clear consent	Personal data is collected without the knowledge of the individual or without clear consent.	Clear communication on when personal data is being collected and how it will be used. Clear consent processes and transparent communication on data ownership and how to withdraw personal data.

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FINANCIAL

We have developed a financial plan that will enable us to implement all aspects of our Smart Cities program scope, on time and on budget. Project Implementation Plans will advance us achieving our project outcomes. Each team has developed a project budget based on a comprehensive work-breakdown structure, resourcing requirements and project schedule. We know that our plan is important for our community, partners and others across Canada. For that reason our plan is diversified and includes private and public sector investment to ensure we can achieve our outcomes in addition to the Challenge. To ensure the efficacy of our budget, the City has worked with external consultants to develop our Smart Cities budget.

8.1 FINANCIAL PLAN

The financial plan for the prize money is built on two components of the City's implementation of the Smart Cities Challenge:

1. **Project Level:** Bottom-up cost buildup of the eight projects, test cases and the subsequent operations and maintenance of these projects. For detailed scope information please refer to Chapter 1.
2. **Program Level:** An additional level of management and tracking necessary to:
   - Deliver an effective and integrated Smart Cities program (refer to Chapter 3);
   - Continue ongoing engagement with our residents (refer to Chapter 6 for details);
   - Complete all implementation requirements including a robust Climate Lens Assessment (refer to chapter 9 for details);
   - Deliver on our Smart Cities sustainment strategy (refer to Chapter 3 for details);
   - Build core capacity including the following potential key functions to deliver our Smart Cities program:
     a. Smart City Program Manager and Partner Engagement
     b. Smart City Program Administration
     c. Community Engagement and Outreach
     d. Climate Lens Assessment
     e. Data Scientist

8.2 SMART CITIES BUDGET

As detailed in Chapter 1, we intend to deliver the outcomes of our Smart Cities Challenge through eight projects in the budget below and additional projects outlined later in this chapter. The table below summarizes the capital cost for each project. The cost details by year and by type can be found in Appendix 8.1. Also identified are any associated operating costs, contingencies, cost savings, and alternative funding.

"Public message boards would be a good idea. Perhaps network existing community centre and school digital signs and then build additional signage locations. In an emergency the Internet may be out of service and the cellular networks may be jammed and unusable."

- Survey response

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TABLE 8.2 Smart Cities Budget

PROJECT	CAPEX BUDGETED COST
1.1 Smart Streets	$ 14,112,446
1.2 Sustainable Transportation	$ 3,775,464
2.1 Integrated Smart Alerts and Post-Disaster Assessment	$ 3,263,800
2.2 Resilient Energy for Emergency Assets	$ 10,878,153
2.3 Intelligent Operations Hub	$ 22,383,541
3.1 MyRichmond	$ 1,524,170
3.2 Integrated Communication Tools	$ 300,349
3.3 Smart Way-finding Solutions	$ 6,098,726
TOTAL	$ 62,336,649*

*$10,200,000 is currently allocated in the City's Five Year Financial Plan

The total capital cost of $62,336,649 is based on a five year implementation schedule for the Smart Cities projects. To arrive at each period's cash flow, the identified costs were subsequently escalated to account for inflation at 2.5% per year. For conservatism, all cost data was escalated, the savings and funding revenue was not escalated.

8.3 METHODS, SOURCES, AND ASSUMPTIONS

For all of our projects we have established a baseline budget. These budgets were, when possible, created using a bottom up estimating methodology covering all anticipated project expenditures, including contingency and risks through the project's lifecycle. We have verified assumptions and filled gaps through collaboration with vendor and contractor entities, independent consultants as well as advisor organizations who have recently undertaken similar projects. This has resulted in realistic project budgets that reflect the scope and schedule needs.

The Baseline Budget serves as a fixed point of comparison, against which actual performance and progress will be compared throughout the project lifecycle. In order to arrive at the budgets for each project, our project managers used the bottom up build-up of the estimates. Timing of the estimates are in line with each project's Project Implementation Plan. As requested in the Finalist Guide, the project budgets have been broken down into the following categories:

- Construction Costs: (including Hard and Soft Costs)
- Technology Costs: (including Hard and Soft Costs)
- Operating Costs
- Risk Based Contingency
- Assumptions for each project are listed in individual project input sheets in Appendix 8.2.
- Revenue from other funding agencies and savings

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8.4 EXCLUSIONS

Our capital expenditure costs reflect any spend that is specific to the scope of our Smart Cities projects. Notably we have excluded any existing City of Richmond human resources that will not need to be hired to complete our projects. Any additional hires or external resources have been included in our project budgets.

8.5 CONTINGENCY

Once each Project Team completed their project estimate, the Project Office, with assistance from a Project Management Consultant, completed an estimate review process. Based on the outcome of this review each project was assigned a contingency factor of low, medium or high, based on the level of confidence in the project estimates, which was applied to the total capital expenditure. The contingency amount allocated based on each project's contingency factor is $11,456,771 and is in addition to the capital costs.

CONTINGENCY FACTOR	PERCENTAGE OF ESTIMATED COST
Low	10%
Medium	15%
High	20%

8.6 FINANCIAL TOOLS AND ACCOUNTING METHODOLOGIES

As detailed in Chapter 3, the project cost, schedule and quality will be managed using defined processes and systems. To monitor and manage the budget effectively, we will track and report on project performance and costing using the City's financial management system, PeopleSoft. This application has the ability to record, track and report on project budgets by WBS and cost types.

The City of Richmond follows the public sector accounting standards, as established by the Public Sector Accounting Board (PSAB). Under these standards, the City follows the accrual method in reporting financials. Using the accrual method, income will be reported when earned, and expenses will be recorded when incurred.

8.7 CONTRIBUTIONS

During the Finalist Phase we have worked within the city and with advisors to amplify the contributions and reach of our Smart Cities projects.

8.7.1 CITY CONTRIBUTIONS

Of the $62,336,649 Smart Cities Program budget, $10,200,000 is currently allocated in the City's Five Year Financial Plan. The remaining funding required will be matched with existing senior government grants or other funding sources where possible to maximize City funding and existing Provincial and Federal programs. Richmond City Council has approved the plan for the Smart Cities Challenge submission and has approved $100,000 toward the submission to the Innovation Superclusters Initiative led by MDA.

The City is building upon the following investments of $66,300,000 from the last five years:

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Table 8.7.1 City of Richmond 2014 to 2018 Infrastructure Investment

AREA	ESTIMATED INVESTMENT	
Digital Strategy	$5,800,000	Digital Strategy implementation, including investment in existing MyRichmond platform.
Disaster Mitigation	$58,000,000	Investment over the last five years for flood mitigation and drainage infrastructure.
Sensor Technology	$2,500,000	Investment in sensor technology across the city, including: drainage sensors, river level sensors, water meters, rain sensors, flow sensors, pressure sensors, temperature sensors, salinity sensors, transportation and traffic count sensors, and road temperature sensors.
TOTAL	$ 66,300,000	

Over the 2014-2024 period, the City of Richmond's investment totals $76,600,000 relating to the Smart Cities initiative. Additionally, the City is providing personnel and functional support required to complete our Smart Cities Challenge projects.

8.7.2 GOVERNMENT OF CANADA'S INNOVATION SUPERCLUSTERS INITIATIVE

We have leveraged the opportunity, work and excitement of the Smart Cities Challenge into a significant $5.4 million dollar economy-energizing investment from a public and private advisor coalition to pilot a flood detection/traffic safety program in support of the City's existing Engineering and Public Works sensors. MDA is spearheading this project to be submitted to the Government of Canada's Innovation Superclusters Initiative supporting business-led innovation through a number of high-value, strategic investments. Richmond City Council has approved the $100,000 toward the submission as well as the use of City resources to achieve the project outcomes.

While MDA is taking the lead, they are working with the City hand in glove to align activities, learnings and benefits with our Smart Cities projects. The total project budget for this initiative is $5,400,000 and is currently being negotiated. For a summary of contributions for this initiative, refer to the Confidential Annex.

"Best wishes to the team as you enter the home stretch! You should be very proud of all the work that has been done so strategically and so collaboratively on this project. It has truly been an honour to be part of it."

- Marlyn Graziano, Vice President, External Affairs, Kwantlen Polytechnic University

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8.7.3 ADVISOR AND PARTNER CONTRIBUTIONS

Our advisors are also contributing significantly to our Smart Cities projects. We have secured firm or near-firm financial commitments valued at approximately $4,891,000 from various project partners. These funds will be used to support implementation and transferability of our Smart Cities projects. We will continue to pursue additional funding.

Table 8.7.3 Advisor and Partner Contributions

ADVISOR	INVESTMENT OVER FIVE YEARS	CONTRIBUTION ESTIMATES
Street Furniture Contractor	Provision of equipment	$ 1,945,000
ICBC	Traffic Safety Cost Sharing —Traffic Cameras	$ 975,000
Hotel Tax	Financial Contribution to Smart Way-finding	$ 500,000
Provincial Grants	Electric Vehicle Charging Infrastructure	$ 416,000
Provincial Emergency Management Technology Cluster	Intelligent Field Operations Platform and Analytics	in negotiation
TransLink	Financial Contribution to Smart Way-finding	$ 345,000
BC Hydro	Financial Grants — LED Light Installation	$ 160,000
TransLink	Financial Contribution — Fast Charging	in negotiation
TIBCO	Traffic Analytics	$ 175,000
TELUS	Pure Fibre Program	$ 375,000
TOTAL		$ 4,891,000*

*Amounts include contributions in addition to the project details.

8.7.4 TOTAL CONTRIBUTIONS

Contribution of our advisors and partners equates to an approximate value of $10,291,000. The total investment of the alignment of our partners outlined in Chapter 5 is much larger and will be quantified as the projects continue to evolve. The total investment in Smart Cities initiatives will be $134,036,649 through the previously completed City projects 2014-2018 of $66,300,000, the new capital projects identified of $62,336,649 and $5,400,000 for the Innovation Superclusters Initiative.

The City will be able to leverage the $10,000,000 Smart Cities Challenge Prize with the firm or near-firm advisor and partner contributions of $4,891,000 along with the $5,400,000 funding for the Innovation Superclusters Initiative. Additionally, various projects included in Richmond's Smart Cities Challenge five year plan qualify for additional Federal funding. Projects that potentially can be leveraged for additional funding, typically up to 50 percent, are included for information in Appendix 8.3.

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8.8 FINALIST GRANT

We have used the Finalist Grant to develop comprehensive Project Implementation Plans for each of our Smart Cities projects, the final report, final video, to hire key consultants and suppliers to provide inputs into our plans, and to support proof-of-concept test case activities. We have strategically focused on using the funding received from the Smart Cities Challenge/Government of Canada on key areas where we would achieve the most significant impact and connection to our community. Our community indicated a focus on safety and security and mobility in the Initial Phase and our team confirmed the focus in the Finalist Phase. Through development of our Project Implementation Plans, we have maximized the reach of our projects by using funding to engage stakeholders including government, First Nations, academic and technology sector representatives in the planning and direction-setting. This outreach added significant depth to our project scope, as well as defined partner projects that were aligned with our vision to multiply the impact of the work we are doing. The Advisory Committee work was transformative for the City and will be a true legacy for the next stage of the implementation. It helped us stretch our thinking and capacity significantly.

From a communications perspective, it was challenging to convey the essence of such a complex project into "language" our community and stakeholders could relate to. Communications materials needed to be created that were clear and informative and help our residents and businesses understand how the infrastructure and technology we are recommending can directly improve their lives. An overview of our outreach and engagement strategy is included in Chapter 6. The Challenge video was also essential to explaining and framing the project to reach a broader audience.

The City of Richmond is grateful for this opportunity and we have heard many positive comments back from the community.

A breakdown of our expenditures during the Finalist Phase is provided in the table below:

Table 8.8 Finalist Grant Expenditures

CATEGORY	DETAILS	AMOUNT
Proposal Development	Video, graphic design	$ 17,200
Community engagement activities	Website development, KPU Smart City Ideas Fair, engagement and communication, planning and implementation	$ 76,800
Presentation to the Judges in Toronto	Two staff travel to Toronto presentation and meetings	$ 6,800
Advisory support and consultants	Project management, business case development, Project Implementation Plans	$ 154,200
TOTAL		$ 255,000

8.9 PROJECT IMPLEMENTATION PLANS

The City has developed detailed Project Implementation Plans for each of the eight projects that form our proposal. A sample of a completed Project Implementation Plan is included in the Confidential Annex.

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8.10 PAYMENT SCHEDULE

We have proposed a payment schedule that is tied to our progress towards outcomes, is in line with the requirements of the Finalist Guide, and is appropriate in the context of project timelines, deliverables, and milestones. Below are four deliverables and proposed payment triggers to be included in outcomes-based contribution agreement:

Table 8.10 Deliverables to Trigger Payment Schedule

ACTIVITY	DELIVERABLES	ANTICIPATED REALIZATION DATE	PAYMENT AMOUNT
4 Data Sharing Agreements in Place	MDA Data sharing for test case EMBC data sharing for Early Warning System MOTI data sharing agreement for seismic sensors Provincial data sharing agreement for situational awareness test case with existing sensors	February 2020	$ 2 M
MyRichmond App launched to public	Mobile notification added, MyBusiness integration	May 2020	$ 2 M
Connect fibre optic cable to 100 intersections	Increased situational awareness and high definition cameras and sensors enabled	January 2021	$ 3 M
Communications Platform for flood mitigation launched for Intelligent Operations Centre	Map of Richmond identifying flood mitigation sensors in real time with baseline identified	March 2021	$ 3 M
TOTAL			$10 M

8.11 RISKS AND MITIGATION

The table below identifies the risks and mitigation specific to Smart Cities finances:

Table 8.11 Smart Cities Finance Risks and Mititgation

RISK	DESCRIPTION	MITIGATION
Inaccurate cost estimates	Inaccurate cost estimates can arise from insufficient planning or information (e.g. resource planning, pre-implementation studies).	Base project costs on well-established plans and a comprehensive work breakdown structure. Leverage third parties with expertise to provide/affirm pricing. Base pricing off recent actuals. Include a contingency amount to account for residual risk.
Unforeseen costs	As we will be implementing technology that is brand new to the City's operations, there are limited in-house sources on cost details readily available.	Confirm costs through third party experts or entities with recent experience. Establish contingency reserve set aside that to be used to cover any unforeseen costs that may arise.
Unexpected project complexity	Unexpected project complexity can lead to further costs.	Projects are resource planned from the bottom up to minimize additional resourcing costs that are not planned for. Complexity is measured and assessed as part of project planning.
Lack of sustained commitment	Leadership commitment wains as the project progresses and financial support is reduced or eliminated.	High level support from City Council and Senior Management has helped to drive this initiative. Financial commitments required for the duration of the initiative have been transparent. A change management approach has created strong and broad support. A sustainment strategy has been put in place.

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IMPLEMENTATION PHASE REQUIREMENTS

Our Smart Cities projects have been planned to address our various requirements and commitments to our residents and other stakeholders. This includes our commitments to meet applicable municipal, provincial, and federal reporting and legislative and policy requirements.

9.1 INDIGENOUS ENGAGEMENT

We recognize the importance of good faith engagement and understand the legal duty to consult for the Provincial and Federal Governments may be triggered by any Crown conduct that may adversely impact any potential or established Aboriginal or Treaty rights. We have established relationships with neighbouring First Nations. These include the Musqueam Indian Band, Tsawwassen First Nation, and Squamish First Nation.

Our engagement procedures support the federal and provincial guidelines, including the federal Aboriginal Consultation and Accommodation – updated Guidelines for Federal Officials to Fulfill the Duty to Consult (March 2011) and the provincial guidelines, Updated Procedures for Meeting Legal Obligations when Consulting with First Nations (May 2012).

The City of Richmond has a long-term relationship with the Musqueam Indian Band. Musqueam representatives have participated on the Advisory Committee for the Smart Cities Challenge. We intend to collaborate to develop technology solutions that can help the Musqueam people as they see fit. By their participation as a member of our Advisory Committee, we want to ensure that the needs and interests of their community are addressed as we move to the implementation phase of the Smart Cities projects.

We have reached out to all three First Nations to begin dialogue on our Smart Cities Challenge program.

9.2 COMMUNITY EMPLOYMENT BENEFIT (CEB)

Richmond is a vibrant, rapidly developing city with a strong economy that has attracted thousands of its residents from around the world. Our population has the highest proportion of immigrants of any city in Canada. 74% of our population originates from Asia-Pacific countries with at least 54% speaking a language other than English or French at home. The City recognizes the importance of reflecting this cultural diversity in our workforce in order to effectively serve the diverse needs of the community, through the award winning Human Resources program for people with disabilities.

To support our commitment to workplace diversity, the City of Richmond offers a variety of intercultural awareness training initiatives to increase the level of employee awareness and understanding within the workforce. We employ two full-time diversity coordinators and we are working to incorporate diversity and cultural awareness as part of our Respectful Workplace Policy. Richmond also provides a new immigrant welcome package, in multiple languages, to help new residents tap into the wide range of support services offered.

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9.2 COMMUNITY EMPLOYMENT BENEFIT (CEB)

Promotion of diversity is demonstrated through:

- Applying different problem solving skills towards a common goal
- Building relationships with different community groups
- Embracing diverse perspectives and approaches that foster innovation
- Guiding decision making and planning through inclusion, cooperation, dynamism, integration, and equality
- Providing equal opportunity in all areas of our work
- Implementing systems and procedures that consider individual differences in all aspects of our service and planning delivery

We are committed to participate in Infrastructure Canada's Community Employment Benefits Initiative. We already have a strong commitment to workplace diversity and are dedicated to continue our diversity strategy with our Smart Cities Projects. We will continue to provide employment and/or procurement opportunities to the groups targeted by the CEB initiative including apprentices; Indigenous peoples; women; persons with disabilities; veterans; youth; recent immigrants; and small-sized, medium-sized and social enterprises. We will establish specific targets for our projects, allowing for flexibility to consider various factors such as complementing our existing employment initiatives and our local labour market dynamics.

9.3 REPORTING

We will provide Infrastructure Canada with our benefit targets for the federal target groups listed above. This will be completed as soon as possible after the Challenge award outcome. We will report annually on our progress against the targets for each project which will include the number of hours worked by a target population and/or the value of contracts provided to target groups. We will identify key successes as well as any challenges in attempting to meet the project targets. We have assigned a dedicated resource who will collect, manage and track the required data to report against our targets.

9.4 CLIMATE LENS ASSESSMENT

The City of Richmond has a strong commitment to addressing and mitigating climate change. The City has achieved carbon neutral status annually since 2013 and anticipates maintaining that status for the foreseeable future. From 2007 to 2015, the City reduced Greenhouse Gas emissions by 12%, despite a population growth of 12% in the same period.

We are committed to undertaking a comprehensive Climate Lens Assessment to provide meaningful insight into the climate impacts of individual projects and to ensure consistency with shared federal, provincial and territorial objectives articulated in the Pan-Canadian Framework for Clean Growth and Climate Change.

As our project has both climate change mitigation and climate change adaptation, resilience and disaster mitigation elements, we will conduct both requirements under the Climate Lens Assessment: the GHG Mitigation Assessment and the Climate Change Resilience Assessment.

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IMPLEMENTATION PHASE REQUIREMENTS

9.4.1 GREENHOUSE GAS MITIGATION ASSESSMENT

We will procure a qualified assessor (i.e., a professional engineer or GHG Accounting Professional) to conduct the assessment who will provide an attestation confirming that the assessment conforms to the guidance provided by Infrastructure Canada and aligns with the relevant assessment standard. Our Mitigation Assessments will consider the same greenhouse gases tracked through Canada's National Inventory Report and will include all direct and all significant indirect emissions. We will assess each project across the construction and operations and maintenance phases, and will include estimates of a project's cumulative construction and operations and maintenance emissions over the useful lifespan of the infrastructure.

Our Assessment will include the following components:

- Baseline GHG Emissions Calculations
- Estimate GHG Emissions of Assets
- Net increase / reduction in GHG emissions
- Cost-per-tonne calculations
- Identification of GHG mitigation opportunities

9.4.2 CLIMATE CHANGE RESILIENCE ASSESSMENT

We will procure a qualified assessor (i.e., a professional engineer or GHG Accounting Professional) to conduct the assessment to identify, evaluate and manage risks, resulting in reducing the risk to an acceptable level by enhancing the resilience or adaptability of assets or systems to climate change impacts. They will provide an attestation confirming that the assessment conforms to Infrastructure Canada's Climate Lens Guidance.

The assessment will support more informed decision-making during an infrastructure project's planning and design stages and it will therefore consider the full range of project design choices being made (i.e., location, materials used, construction methods/standards etc.). It will also consider the climate risks during construction and planned operation and maintenance phases and will include asset-specific resilience solutions as well as identify potential upstream and downstream impacts of the proposed solutions within the broader environment. The timescale of our assessment will match the intended lifespan of the asset.

Our assessment will include identification and assessment of climate change risks. Risk will be assessed using the following order and naming convention:

- Climate change hazard
- Impact on asset
- Consequence of impact

9.4.3 ANALYSIS OF RISK, CONSEQUENCES, LIKELIHOOD, AND VULNERABILITY

After identifying and assessing each risk we will conduct an analysis to identify the magnitude of the consequence of an event and its likelihood of occurring. This will be considered in the context of the climate change scenarios being evaluated and the existing controls to manage the risk.

Please find a completed Climate Lens for GHG Change Resilience Assessment from a recent previous project in Appendix 9.1.

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9.5 RESILIENCE MEASURES

We will identify which resilience measures have been analyzed and implemented, including the projected change in resilience as a result. We will also justify why particular risks are not being mitigated against and identify any anticipated residual risk flowing mitigation measures (if any). Where possible we will calculate the return on investment of the projects through a Loss Estimation Analysis and a Return on Mitigation Investment calculation.

9.6 OTHER APPLICABLE LAWS, REGULATIONS, AND POLICIES

We have completed a full review of any applicable laws, regulations and policies and have dedicated resources to ensure that our Smart Cities projects meet all requirements under them. We have identified the following applicable laws, regulations and policies:

- Freedom of Information and Protection of Privacy Act
- Local Government Act
- Fire Safety Act (Bill 4)
- Occupational Health and Safety Regulation
- Safety Authority Act
- Safety Standards Act
- Workers Compensation Act
- Environmental Assessment Act
- Information Management Regulation

9.7 RISKS AND MITIGATION

Table 9.7 Implementation Phase Risks and Mitigation

RISK	DESCRIPTION	MITIGATION
Requirements and commitments are not well understood	Projects proceed without knowledge or understanding of commitments and requirements.	Project plans incorporate legislative requirements and other commitments that inform planning, tracking, reporting and implementation impacts.
Non-compliance to commitments made and requirements	As project activities progress, commitments and legislative requirements are missed.	Strong project governance processes that include a compliance log and reporting that specifically track progress against commitments and requirements.
Lack of baseline data and data collection	Baseline data is incomplete or inaccurate and/or data collection against baseline is insufficient or flawed.	Baseline data is approved through the project governance structure and data collection processes are identified, checked and included in project plans and execution documents.

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CITY OF RICHMOND
PRELIMINARY PRIVACY IMPACT ASSESSMENT (PPIA)

SMART CITIES CHALLENGE

A Preliminary Privacy Impact Assessment (PPIA) process is critical to enable the City of Richmond to properly assess whether the Smart Cities associated projects have privacy impacts and/or comply with the *Freedom of Information and Protection of Privacy Act* (FIPPA).

The PPIA is the beginning step of assessing privacy impacts and serves as the foundation from where comprehensive PIA work will be undertaken by all involved City departments, as the Smart Cities workplan is put into action. This completed PPIA will serve as the framework from where detailed privacy impact assessment and mitigation will take place, and how the Smart Cities projects will be designed to mitigate privacy impacts.

I INTRODUCTION

This Preliminary Privacy Impact Assessment (PPIA) has been undertaken to evaluate the impacts on privacy by the various projects that comprise the City of Richmond's "Smart Cities Challenge" submission. As "Smart City" projects can collect, use and generate large amounts of data, there is a need for strong privacy protection. The "Smart Cities Challenge" project teams have been consulted and has contributed pertinent information that has shaped this PPIA. In regards to privacy protection, the PPIA has started a critical conversation about demonstrating due diligence, legislative compliance, and minimizing the collection, use, retention and disclosure of personal information. There is much more privacy-related work that will need to be undertaken, as the "Smart Cities" workplan and the associated projects proceed towards completion. Privacy protection-related work is not a one-time initiative, it is work that is undertaken from beginning to end of a project's lifecycle and continues into the life of a program. Through the PPIA process, the "Smart Cities" project teams have built in privacy protection and mitigation factors where personal information is being or will be collected, used and/or disclosed. The strength of the City's submission, is that the "Smart Cities" project team is committed to successfully executing the ambitious workplan but not at the expense of privacy protection, as adherence to privacy protection only further strengthens smart cities.

II SMART CITIES CHALLENGE SUBMISSION

As an island city, Richmond has unique challenges in mobility and will be subject to the increasing effects of climate change. The Smart Cities Challenge is an opportunity for the City of Richmond to form new partnerships to resolve important issues using data and connected technology to achieve community benefit. The intention is to create transparent, adaptable plans that can be replicated across Canada using technology and data to transform cities with meaningful outcomes.

The City and its partners have developed a five-year plan to use data and technology to enhance service to the public, better manage everyday incidents and to identify and mitigate risk from emergencies. The plan builds on the City's existing success as a best practice leader in areas such as addressing the effects of climate change, flood protection and emergency response. The three key areas of the Smart Cities proposal are:

1. **Protect our Island City and Address the Effects of Climate Change:** Richmond will continue to address the increasing demands of climate change including extreme weather events, flooding and spills, as it relates to the safety of our island and the change in modes of mobility to decrease greenhouse gas emissions. The work plan and deliverables build on Richmond's ongoing best practice in combatting climate change.

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2. **Deliver More Informed Decision-Making:** Information from internal and external sources will be collected, analyzed and shared for the City and the community to make more informed and time-sensitive, operational decisions. Data will be analyzed using machine learning based technology which will identify factors and patterns that introduce risk. This knowledge will be used to support the implementation of integrated response plans which identify the resources and data required both internally and externally to address the identified risks.

3. **Integrate Communications and Enhance Community Resilience:** A significant element of the Smart Cities Challenge is the engagement of residents, stakeholders, businesses and partners to ensure that the community will benefit from the proposed outcomes. Communication with the public, between first responders and municipal operations is critical and solving breakdowns in communications between responder agencies is a key focus of the proposal.

To support the above-noted three key areas and achieve the desired outcomes of the Smart Cities proposal, the following eight Project Teams were formed:

- Smart Street Infrastructure Project Team
- Sustainable Transportation Project Team
- Integrated Smart Alerts and Post Disaster Project Team
- Resilient Energy Source for Emergency Assets Project Team
- Integrated Operations Hub Project Team
- MyRichmond Project Team
- Integrated Communication Tools Project Team
- Smart Way-Finding Solutions Project Team

The above-noted Teams are responsible for specific "Smart City" projects that will collectively deliver on the City's three key focus areas and respond to the City's Challenge Statement.

III SCOPE OF PRELIMINARY ANALYSIS

This Preliminary Privacy Impact Assessment (PPIA) serves as a critical piece to the City's "Smart Cities Challenge" submission and a necessary starting point for the City of Richmond to put privacy at the forefront, as the projects in the detailed submission workplan evolve and come to eventual fruition. While the Smart Cities submission for the City is ambitious and forward thinking, however, the fundamental aim of this PPIA is to ensure that the consideration and protection of privacy issues is at the forefront of all decisions. With the undertaking of the PPIA at this juncture, the consideration of privacy protection is being incorporated into the planning and design of the "Smart Cities" projects wherever possible. The ultimate goal of the PPIA is to ensure that there is a collective commitment to privacy being part of every workplan milestone, rather than a mere future afterthought. As the implementation schedule of the key activities and associated projects is from 2019 to 2024, detailed Privacy Impact Assessment work will need to be undertaken within each specific project area. This PPIA will need to be updated, adjusted and supplemented as the overall work plan proceeds.

At this stage, this PPIA aims to determine what personal information is being and may be collected, used and disclosed as part of the key projects. This PPIA is just the beginning, as project details are not all entirely known or determined at this point. What is known at this point is that further comprehensive privacy analysis will need to be undertaken over the next five years, as the milestones for all project components are realized. The undertaking of the PPIA process as part of this submission has been invaluable to all involved Project Teams, as there is a strong understanding and commitment to protect personal information, to understand the legislative authority to collect personal information and to design projects with a goal of minimizing risks to the City.

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IV GOVERNANCE FRAMEWORK/LEGAL AUTHORITY

The City of Richmond's privacy practices are governed by British Columbia's *Freedom of Information and Protection of Privacy Act (FIPPA)*. The City is committed to following the legislation in its collection, use and disclosure of personal information.

Additionally, the following guidance documents by the Office of the Information and Privacy Commissioner are vital documents which the City uses in its practical application of the regulations set forth in *FIPPA*, and will be consulted regularly during the implementation stage of the Smart Cities Project:

- "Obtaining Meaningful Consent" May 2018 - https://www.oipc.bc.ca/guidance-documents/2255
- "Information Sharing Agreements" September 2017 - https://www.oipc.bc.ca/guidance-documents/2066
- "Guidelines for Online Consent" April 2013 - https://www.oipc.bc.ca/guidance-documents/1638
- "Public Sector Surveillance Guidelines" January 2014 - https://www.oipc.bc.ca/guidance-documents/1601
- "Accountability Privacy Management in BC's Public Sector – June 2013 - https://www.oipc.bc.ca/guidance-documents/1545

Information management, including privacy management, is delegated to the City Clerk, per the City's Bylaw 7400 – Corporate Records Management Program (https://www.richmond.ca/__shared/assets/bylaw_7400463.pdf). This Bylaw establishes that the City Clerk must "protect personal information, as defined in the *Freedom of Information and Protection of Privacy Act*, by making reasonable security arrangements against such risks as unauthorized access, collection, use, disclosure or disposal." Additionally, this Bylaw states that "all City records, including those in electronic form, are to be appraised for retention under the direction of the City Clerk and retained in accordance with the Uniform Classification and Retention System." The City's Classification and Retention System takes into consideration all relevant legislation, including the provisions of *FIPPA*, in establishing retention periods for personal information.

Additionally, departments who frequently handle sensitive personal information follow departmental policies and procedures on information handling practices. Those departments also provide privacy training to their staff, often with the advice and support of the City Clerk's Office. City-wide privacy training is conducted through an intranet portal maintained by the City Clerk's Office, and further training programs to increase privacy awareness is in the works.

The City is also committed to completing the Privacy Impact Assessment (PIA) process for every new and changed program or initiative which involves personal information, as per the Minister of Technology, Innovation and Citizens' Services directive M224 – "Privacy Impact Assessment Directions to Heads of Public Bodies That Are Not Government Ministries", effective May 9, 2014. The City Clerk's Office has provided privacy advice to staff on initiatives and projects, large or small, long before the Ministry's directive in 2014. The City has conducted over 50 Privacy Impact Assessments since the 2014 Directive was issued, on a variety of City initiatives. Through the Privacy Impact Assessment process, City staff have an opportunity to further develop their knowledge base on privacy issues, ensure the organization is following *FIPPA,* and continuing to protect personal information of its citizens.

Key Concepts and Definitions

According to the Smart Cities Challenge Finalist Guide, "winners will . . . to the extent possible, make data available publicly, build analytics in-house, and avoid being locked in with specific vendors in a way that hinders them and other communities from leveraging the data. At the same time, winners will need to secure highly sensitive data, defend against security breaches, and protect personal information and privacy."

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Key concepts of the Smart Cities Challenge include:

- Data must be open and publically owned
- Personal privacy must be protected
- Provincial law prohibits the storage of personal information outside of Canada
- Always pursue the least privacy-invasive option wherever possible
- Be aware that information you or your partners collect may not identify an individual on its own, but should this information be combined and analyzed with information from different sources it may become identifiable personal information
- Data collected about a person should be de-identified, and not possible to re-identify when combined with other data

This Preliminary Privacy Impact Assessment is a combination of these key concepts as well as the definitions and regulations which form the protection of privacy program in *FIPPA*. While the City of Richmond does not fall under *the Personal Information Protection and Electronic Documents Act (PIPEDA)* and our analysis at this point has used *FIPPA,* we are fully committed to protecting the privacy of our citizens. The City is committed to working in alignment with the following *PIPEDA* "Fair Information Principles": Accountability; Identifying Purposes; Consent; Limit Collection; Limit use, Disclosure and Retention; Be Accurate; Use Appropriate Safeguards; Be open; Give Individuals Access; and, Provide Recourse. Please refer to Attachment 12 that details how the City will comply with the *PIPEDA* Fair Information Principles.

V SMART CITIES - PROJECT SUB-TEAMS

The Smart Cities submission is framed around the following identified outcomes:

- Protect our Island City
- Deliver More Informed Decision-Making
- Integrate Communications and Enhance Community Resilience

In order for the above outcomes to be realized, the following project teams have been established:

Smart Street Technology

1.1 Smart Street Infrastructure Project Team: Objective is to create Smart Streets through connected sensors and decrease the rate of traffic incidents at intersections. There are 6 projects associated with this objective.

1.2 Sustainable Transportation Project Team: Objective is to prepare for sustainable and future technology, and transition to electric modes of transportation. There are 5 projects associated with this objective.

Smart Disaster Mitigation Technology

2.1 Integrated Smart Alerts and Post Disaster Project Team: Objectives are to detect emergency incidents and assess damage, and develop an integrated smart alert system. There are 8 projects associated with this objective.

2.2 Resilient Energy Source for Emergency Assets Project Team: Objective is to equip infrastructure with renewable power to function for at least 72 hours when the central electrical grid is compromised. There are 6 projects associated with this objective.

2.3 Integrated Operations Hub Project Team: Objective is to create an integrated municipal operations hub with all levels of government. There are 6 projects associated with this objective.

Integrated and Connected Communities

3.1 MyRichmond Project Team: Objective is to implement MyRichmond personalized engagement platform. There are 5 projects associated with this objective.

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3.2 Integrated Communication Tools Project Team: Develop key communication tools with partners and develop key communication tools which target diverse communities. There are 5 projects associated with this objective.

3.3 Smart Way-Finding Solutions Project Team: Objective is to develop way-finding solutions for everyday and emergency situations. There are 3 projects associated with this objective.

The PPIA process has involved working with each of the above project teams to determine if personal information will be collected, used or disclosed, and most importantly, how personal information will be protected. While this PPIA process has been comprehensive, there is recognition that we do not have all the project details in place at this time and as such, comprehensive PIA work may need to be undertaken with each of the Project Teams as the projects develop and evolve. Furthermore, the work with the various partners, as outlined in the submission, will be collaboratively reviewed with a privacy lens at the appropriate time.

VI COLLECTION AND USE OF PERSONAL DATA

As part of the PPIA work, each above-noted Project Team completed a PIA questionnaire comprised of the following questions:

- Describe what information may be collected, used or disclosed
- If no personal information may be collected, please explain why
- Describe the legal authority (if known) being used to collect, use or disclose personal information for this project
- Include an Information Flow Map which outlines each collection, use or disclosure of personal information.
- Describe from whom you will collect personal information form and the authority for that collection.
- Describe how you will use personal information being collected.
- Describe to whom you will disclose personal information and how may this information be used by the third party.
- Describe how you will collect meaningful consent from individuals whose personal information is being collected, used or disclosed.
- Describe how you will ensure the security of any personal information being collected, used or disclosed.
- Describe who will own and control the personal information being collected, used or disclosed. Describe how you will avoid private-sector ownership to the best of your ability.
- Describe any opportunities for the data collected for your project to be provided openly and transparently to the public.
- Describe the risks associated with the open data collection, the potential impacts and what the mitigation plan could be.

A summary of the key points regarding the collection, use and disclosure of data is provided below for each Project Team. The detailed questionnaires to the above-noted questions, from the eight Project Teams, are attached for reference (Attachments 2 to 9).

In addition, a PIA Data Collection Table has been developed that summarizes the data collection, use and disclosure for each of the projects and the corresponding legislative authority (refer to Attachment 1).

1.1 Smart Street Infrastructure Project Team: With the use of sensors and CCTV technology, video footage of vehicles, cyclists and pedestrians moving through the City's major intersections will be collected and used for traffic signal timing, long range transportation planning, traffic flows and other uses as outlined in the questionnaire. Personal information will not be collected by these sensors, as vehicle counting technology will not include the collection or storage of any unique identifiers of the vehicles, registered owners or drivers. Other sensor data will not record any clear audio of members of the public as they pass through intersections. In terms of disclosure, traffic count data is open to consultants and the

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public and video camera footage may be made available to RCMP and ICBC, or possibly other investigatory bodies, for specific investigations.

1.2 Sustainable Transportation Project Team: Personal information collected will be information regarding electrical charging transaction, usage and location, linked through a unique ID and provided to the City by a third party vendor for the purpose of tracking overall usage of the system. In addition, Device ID information for the purposes of providing a wi-fi access will be collected. The personal information collected will solely be for the purpose of providing services to the users. The information may also be anonymized and compiled for statistical purposes. The anonymized data could be shared with the public, but no information which could be collected will be shared outside of the City and with the third party vendor (Chargepoint).

2.1 Integrated Smart Alerts and Post Disaster Project Team: Personal information collected may include video footage capture by public/private camera systems and deployed drones, which may include personal information. Water meter information by itself does not include personal information, but it is generally combined with personal information for billing, however billing is out of scope for this objective. None of the sensor information is directly connected to personal information. Facial recognition software and a database that connects a face to an individual would be required to identify individuals in drone imagery. There are no plans to implement such a software. In terms of public access, water pressure, drainage water level, sanitary sewer water level and air quality information could be provided to the public. While air quality information has some value to the public, water pressure may not be of interest to the public.

2.2 Resilient Energy Source for Emergency Assets Project Team: The objective relates solely to establishing emergency power infrastructure and does not require the collection, use or disclosure of personal information.

2.3 Integrated Operations Hub Project Team: The Integrated Municipal Operations Hub dashboard will collect, use and disclose the following categories data: (a) raw sensor data, to be shared only internally; (b) sensor data which has been aggregated through machine learning algorithms to be non-specific and anonymized, to be shared externally; and, (c) insights and actions taken based on data collected, which will not include personal information. Day to day operations will continue to use current or to-be-developed database systems, which will remain separate and distinct. Those databases will not integrate through the virtual dashboard, and will not be shared with outside partners. All sensor information collected through the HUB and displayed through the dashboard will be aggregated data, and filtered via machine learning. It will be considered "ready to share."

3.1 MyRichmond Project Team: MyRichmond is a City services web portal which allows customers to see all City services relevant to their needs and interests in one place. Customers create a profile, using their name and email address. Customers can choose to register their date of birth, phone numbers, and mailing address. They can also choose to link their accounts from different City systems by using their unique identifier from each system. The data from these systems is presented to the customer through MyRichmond after passing through the Digital Nervous Ecosystem (DNE). The customer's data remains in the separate systems. As part of the Smart Cities Challenge, MyRichmond will be expanded which will include a new view through the portal, MyBusiness. Personal information is being collected related to setting up personal profiles, location services data, home address, family emergency plan data, and data to enable the reporting of damage.

3.2 Integrated Communication Tools Project Team: In order to use technology to increase communication with partners and the public for the purpose of emergency preparedness and emergency notification, the following personal information will be collected: contact information (name, email address, phone number, address), location data, program registration information, and opinions, questions, comments or concerns. It is not anticipated that any personal information collected for this objective will be shared with any external partners. The personal information collected will be collected directly from the user. Some personal information may be gathered from social media sources which are publically available on the internet.

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3.3 Smart Way-Finding Solutions Project Team: In identifying and developing a wayfinding strategy for every day and emergency use, the following personal information will be collected: Device ID information for providing wi-fi access, charging smartphones and for members of public who are passing or standing at the smart kiosks. Some personal information will be collected directly from the user and Device ID information might be collected indirectly from members of the public who are walking past or standing at the smart kiosks.

VII DATA FLOW

As part of the PPIA, a Data Flow and Model document has been developed by staff from the City's Information Technology Division. Of key importance to highlight is the consideration and incorporation of privacy and security within the technical components of software and hardware architecture. The key points of the Data Flow document include the following:

- Create Smart Cities Architecture by following TOGAF methodology. Requirements from projects inform the information components of the architecture. The Information Components are combined with industry best practices and models to derive the Application Components of the architecture. This is recorded and saved as a Microsoft Visio file.
- The same project requirements are fed through the architecture to capture privacy and security capabilities that are then attributed to the Application Components. The result is an updated architecture that includes privacy and security components to satisfy project privacy and security requirements.
- The project requirements are fed through the architecture again in the form of Use Cases. The journey of each Use Cases is documented as a story in bullet form. The Information and Application Components of the architecture that participated in the journey are listed in table and diagram format. Together they form the Data Flow and Model document.
- Going forward, the Smart Cities Architecture and Data Flow document become part of the technical blueprint to guide project teams in products / solutions selection and further downstream implementation activities.

The Smart Cities Data Flow is attached for reference (Attachment 10).

VIII SECURITY

The following section provides a high-level overview of the key components and considerations pertaining to the security of personal information.

Description of the physical security measures:
On-premise physical security measures is based on Facilities' policies. In addition, on-premise Information Technology (IT) server rooms are locked and accessible only to IT members who need to work directly with the equipment. Off-site (hosted) equipment are governed by legal contracts with the hosting providers. These contracts require the providers to pass SOC 2 type II certifications, to comply with ISMS family of standards including ISO 27001/27002/27017/27018, and to pass SSAE 16 audits.

Description of the technical security measures:
We use multiple firewalls, isolated network segments, server certificates, and network encryption to protect data flowing between servers on our networks. We have the capabilities to encrypt data stored in our databases and file systems and these capabilities can be enabled for information that require that level of protection.

Application of security policies:
IT uses City Administrative Directives and departmental Standard Operating Procedures to enforce access privileges. We are currently in the review stages of our Security Policy and expect to implement that after review.

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Limiting and restricting unauthorized changes to personal information:
The City's applications handling sensitive information use role-based access to restrict access to privileged functions to specific groups of end users. The Information Owners in business departments are responsible for approving access to applications. Production system changes are governed by IT Change Management process where the change is documented, reviewed, and approved, before the change is executed and verified.

Tracking access to personal information:
The City's applications can produce an inventory of accounts along with the groups they belong to. We can correlate these to the level of access to personal information an account has. The account that is used to change sensitive data in an application is recorded along with the change record to track the change initiator. Our Record Management System tracks all check-in, check-out, views, and change initiators for each document. The business departments initiate removal of access rights. When an individual leaves the City, the affected department goes through the HR process to remove the individual from the HR system, and that triggers processes to remove the individual's other accounts from City systems. When an individual changes department, the affected manager follows an IT change process so that access rights are removed based on the new responsibilities of the individual.

IX PRIVACY ANALYSIS AND MITIGATION STRATEGY

Based on the above overview of the personal information that is being and may be collected as part of the various Smart Cities projects, it is critical to determine at every stage of the process how privacy risks can be minimized. The PPIA is only one small step in terms of assessing how privacy will be protected and how threats to privacy breaches will be mitigated. Based on the information submitted as part of the questionnaires, privacy protection is at the forefront of all projects due to commitment to the following mitigation actions:

- ***Data Minimization*** *– collecting only information that is required;*
- ***De-Identification*** *– taking steps to remove any identifiable information at the earliest opportunity;*
- ***Informed Consent*** *– obtaining consent whenever possible from individuals whose personal information may be used;*
- ***Transparency*** *– acknowledgement that notifications will need to be provided to users to clearly state the purpose for using their information;*
- ***Public Access*** *– making non-personal information available to the public as a resource*

A summary of the key points regarding mitigation steps to protect privacy is provided below for each Project Team. The detailed questionnaires, from the eight Project Teams, provide greater detail and are attached for reference (Attachments 2 to 9).

1.1 Smart Street Infrastructure Project Team: Video data will be securely stored on a server for a reasonable period of time. The data will be destroyed after the holding period. The City will follow the OIPC's "Public Sector Surveillance Guidelines" for best practices. Additionally, it will seek out camera technology which will limit the collection of personal information. It will not be possible to obtain consent from individuals at the time of actual collection, and as such the City will need to ensure for proper notification of the collection, through signage and other public awareness measures.

1.2 Sustainable Transportation Project Team: The minimum amount of personal information will be collected for this objective. Use of the electrical charging stations will require customers to sign up for a Chargepoint account. Thus, the personal information in the custody and control of the City will be provided from Chargepoint. The City will not be providing any personal information to the third party vendor (Chargepoint). Anonymized data could be shared with the public and any data which might be made open to the public will be reviewed to ensure it is aggregated and anonymized, and unable to be traced back to an individual transaction.

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2.1 Integrated Smart Alerts and Post Disaster Project Team: There are no tangible risks to publishing water pressure, drainage water level, sanitary sewer water level and air quality information. All of this information is currently available on an FOI basis. The City currently publishes water levels outside of the dike on the City's website and there have not been any negative repercussions to date.

2.2 Resilient Energy Source for Emergency Assets Project Team: There is no personal information being collected, used or disclosed for this objective.

2.3 Integrated Operations Hub Project Team: There is no personal information being collected, used or disclosed. Any information which will be shared with a third party will be aggregated and anonymized before sharing, so it is not anticipated that personal information will be shared with third parties. All information sharing with third parties will be covered by Information Sharing Agreements in order to mitigate the City's risk, and to determine the scope and terms of the information being shared between the City and those partners. A further mitigation could involve allowing open access to the dashboard for the public.

3.1 MyRichmond Project Team: Consent is collected when registering and interfacing with the MyRichmond App, the City will own all data collected for this objective, including personal information. MyRichmond uses the Digital Nervous Ecosytem in order to link disparate City database systems to the customer. In order to provide services to individuals, the data cannot be de-identified. Each database remains a separate system, and systems are not linked. The systems are only linked through unique identifiers which minimizes risk to the customer. There are no open data opportunities with this objective. However, MyRichmond will be used as a tool to access other publically available data.

3.2 Integrated Communication Tools Project Team: When users initially register to the relevant systems (Richmond Emergency Notification System, Perfectmind, Let's Talk Richmond), consent is collected and each system is completely voluntary. Any personal information which may be collected through social media channels will be sourced from publically available information. Where information about program registration, taken from Perfectmind, is used for analysis by Emergency Programs, users of the Perfectmind system will be notified of this use at the point of collection. The minimum amount of personal information will be collected for this objective, and there are no open data opportunities with this objective.

3.3 Smart Way-Finding Solutions Project Team: Device ID information will not be stored long-term, it will be used for real-time notification and services. Any personal information collected will not be disclosed or shared, and consent will be obtained from users when they elect to use the wifi or charging services provided by the wayfinding station. The public will also be notified of indirect collection of their Device ID information. The minimum amount of personal information will be collected for this objective.

The detailed questionnaires, from the eight Project Teams, provide greater detail and are attached for reference (Attachments 2 to 9).

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X NEXT STEPS

This Preliminary Privacy Impact Assessment (PPIA) is the first step of many regarding privacy analysis of the City's "Smart Cities Challenge" related projects. As the various project components move along and develop, detailed separate PIAs may need to be undertaken. Addressing privacy matters requires a team approach, as all involved staff and outside partners have a critical role to play in protecting privacy. The Smart Cities Challenge and process has presented a great opportunity for the area of privacy protection to be pushed to the forefront of all critical discussions. Whether or not the City is the winner of the Smart Cities Challenge, the following next steps will need to be undertaken in the immediate future:

- **PIA Updates** – The scope of the overall PIA work will need to be reviewed and updated on a quarterly basis, as the overall "Smart Cities" project implementation progresses. Ongoing assessment of privacy risks will be necessary, as protecting privacy is not a one-time activity. Should the City

- **PIA Team** – A working group of key staff will need to be formed that will support, consult and work with the Project Teams, including outside partners, on privacy-related issues throughout project development and implementation.

- **Governance and Privacy Management Program** – Existing policies within the City should be reviewed to ensure for privacy and security requirements. Work should be undertaken to ensure that the City's privacy and access governance program, includes comprehensive security policies and procedures, strong oversight of third parties and privacy breach response policies.

- **Continued Engagement with Privacy Authority** – As the "Smart Cities" projects proceed, it will be important to continually seek advice from the Office of the Privacy Commissioner of British Columbia (OIPC). Regular feedback from the Privacy Authority will be critical to ensure for legislative compliance at all steps.

- **Obtain Privacy Expertise** - As the "Smart Cities" projects proceed and the privacy analysis further expands, it will be important to bring in experts on board in the privacy protection field to provide guidance and assistance, such as de-identification experts.

XI CONCLUSION

The completion of this Preliminary Privacy Impact Assessment (PPIA) represents one component of the City of Richmond's Smart Cities Challenge Submission. The City's submission is ambitious, multi-faceted and aimed to achieve real, tangible benefits for the City and its citizens. This PPIA has reviewed the work of the eight Project Teams that are overseeing the planning and execution of 44 projects with specific objectives tied to the submission's key outcomes. All Project Teams participated in the development of this PPIA through the completion of detailed questionnaires aimed to assess the degree to which personal information is collected, used and disclosed. In addition, Project Teams have identified means of mitigating impacts to privacy, where personal information is being collected.

The PPIA has confirmed that from beginning to end, the City will need to consider privacy throughout the lifecycle of all the projects associated with the "Smart Cities Challenge". Privacy concerns are real and need to be addressed at the outset of any project, large or small. Furthermore, there is the acknowledgement that the privacy work related to the "Smart Cities" projects will continue to be undertaken, until the successful completion of all projects. A completed PPIA will not alone ensure that privacy safeguards are and will be in place. The identified "Next Steps" will be acted upon to further the City's commitment to privacy protection and strengthen the City's quest to be a leading Smart City.

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XII ATTACHMENTS

1. Smart Cities Preliminary PIA Data Collection Table
2. Smart Cities Preliminary PIA Questionnaire – 1.1 Smart Street Infrastructure
3. Smart Cities Preliminary PIA Questionnaire – 1.2 Sustainable Transportation
4. Smart Cities Preliminary PIA Questionnaire – 2.1 Integrated Smart Alerts and Post Disaster Assessment
5. Smart Cities Preliminary PIA Questionnaire – 2.2 Resilient Energy Source for Emergency Assets
6. Smart Cities Preliminary PIA Questionnaire – 2.3 Integrated Operations Hub
7. Smart Cities Preliminary PIA Questionnaire – 3.1 MyRichmond
8. Smart Cities Preliminary PIA Questionnaire – 3.2 Integrated Communication Tools
9. Smart Cities Preliminary PIA Questionnaire – 3.3 Smart Way-Finding Solutions
10. Smart Cities PIA Data Flow and Model
11. Relevant Sections of the Freedom of Information Protection of Privacy Act (FIPPA)
12. Personal Information Protection and Electronic Documents Act (PIPEDA)

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Smart Cities Preliminary Privacy Impact Assessment
PIA Data Collection Table

Obj #	Personal Information Data Element	Legislative Authority	Collection	Use	Disclosure
1.1	Video footage of vehicles, cyclists and pedestrians moving through the City's major intersections	*FIPPA* s. 26(c) [1]	Data will be collected indirectly from individuals who move through some of the City's signalized intersections.	Vehicle/pedestrian/cyclist count data to be used for traffic signal timing, long range transportation planning, traffic flows, traffic signal warrants, road improvement requirements, traffic-calming measures, speed studies.	Traffic count data is open to consultants and the public. It can be used to forecast traffic pattern flows and transportation planning. Video camera footage may be made available to RCMP and ICBC, for specific investigations.
1.2	Information regarding electrical charging transaction, usage and location, linked through a unique ID and provided to the City by a third party vendor, Chargepoint	*FIPPA* s. 26(c)	For electrical charging transactions, the City will be using a third party vendor, Chargepoint, to administer billing services. Chargepoint collects transaction information, some of which is shared with the City. This information is collected directly from those who sign up for the service.	Some information regarding charging transactions will be shared with the City by Chargepoint, for the purpose of identifying whether the vehicle using the charging station is a City vehicle or a public vehicle. The information may also be anonymized and compiled for statistical purposes.	Anonymized information regarding electrical charging station usage, pedestrian or bicycle counts, or parking spot vacancies, could be shared with the public. No information which could be connected to an individual will be shared outside of the City and Chargepoint.
2.1	Video footage captured by public/private camera systems and deployed drones, which may include personal	*FIPPA* s. 26(c)	Video surveillance data for the purposes of damage assessment may be collected indirectly from individuals whose images may be caught in the footage.	Video surveillance data will be used to assess damage to buildings and City property after a disaster.	Personal information collected for this objective will not be shared. Any information which might be shared will be depersonalized before

[1] *FIPPA* s. 26(c[1]), "the information relates directly to and is necessary for a program or activity of the public body"

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Obj #	Personal Information Data Element	Legislative Authority	Collection	Use	Disclosure
	information.				sharing, either at the point of collection, or through subsequent processing.
2.1	Water meter location and water usage statistics	*FIPPA* s. 26(c)	Water meter data, which includes location and usage only, will be provided to the City by third party vendor Neptune.	Water meter data will be used to flag properties where significant damage may have occurred, i.e. if the meter goes offline or the usage spikes significantly (which may signify a major leak).	Personal information collected for this objective will not be shared. Any information which might be shared will be depersonalized before sharing, either at the point of collection, or through subsequent processing.
3.1	Data elements necessary for the creation of a MyProfile (name, email address, home address, birthdate, unique identifiers for linked City systems, etc)	*FIPPA* s. 26(c)	The personal information collected for the MyProfile, which allows access to MyRichmond, is collected directly from the customer.	The personal information will be used for the purposes of providing the single sign-on, one stop customer services view through MyRichmond, or in order to receive emergency notifications based on user location (either through home address, or cell phone location). The use of personal information for this purpose will be clearly stated through the online consent form.	This information will not be disclosed to any third parties outside of service provider or consultant relationships established for the maintenance of the systems, where they act as agents of the City and the information sharing is managed though agreements. City Services will still be managed in separate database systems.
3.1	Location services data of a user's cell phone, facilitated through third party mapping applications (Google Maps, Apple maps, etc), in order to	*FIPPA* s. 26(c)	The personal information collected for the MyProfile, which allows access to MyRichmond, is collected directly from the customer.	The personal information will be used for the purposes of providing the single sign-on, one stop customer services view through MyRichmond. The use of personal information for this purpose will be clearly stated	This information will not be disclosed to any third parties outside of service provider or consultant relationships established for the maintenance of the systems, where they act as

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Obj #	Personal Information Data Element	Legislative Authority	Collection	Use	Disclosure
	present a user with the location of nearby resources, events and services			through the online consent form.	agents of the City and the information sharing is managed though agreements. City Services will still be managed in separate database systems.
3.1	Home address or location services data of a user's cell phone, to provide "geofenced" emergency notifications on an opt-in basis	*FIPPA* s. 26(c)	The personal information collected for the MyProfile, which allows access to MyRichmond, is collected directly from the customer.	The personal information will be used for the purposes of providing the single sign-on, one stop customer services view through MyRichmond, or in order to receive emergency notifications based on user location (either through home address, or cell phone location). The use of personal information for this purpose will be clearly stated through the online consent form.	This information will not be disclosed to any third parties outside of service provider or consultant relationships established for the maintenance of the systems, where they act as agents of the City and the information sharing is managed though agreements. City Services will still be managed in separate database systems.
3.1	Data elements related to the development of a Family Emergency Plan	*FIPPA* s. 26(c)	The personal information collected for the MyProfile, which allows access to MyRichmond, is collected directly from the customer.	The personal information will be used for the purposes of developing and accessing a Family Emergency Plan. The use of personal information for this purpose will be clearly stated through the online consent form.	This information will not be disclosed to any third parties outside of service provider or consultant relationships established for the maintenance of the systems, where they act as agents of the City and the information sharing is managed though agreements. City Services will still be managed in separate database systems.

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Obj #	Personal Information Data Element	Legislative Authority	Collection	Use	Disclosure
3.1	Data elements related to the reporting of damage during an emergency, to be filtered to the Emergency Management Information System (EMIS)	*FIPPA* s. 26(c)	The personal information collected for the MyProfile, which allows access to MyRichmond, is collected directly from the customer.	The personal information will be used for the purposes of providing the single sign-on, one stop customer services view through MyRichmond, and to notify the City of damage during an incident. The use of personal information for this purpose will be clearly stated through the online consent form.	This information will not be disclosed to any third parties outside of service provider or consultant relationships established for the maintenance of the systems, where they act as agents of the City and the information sharing is managed though agreements. City Services will still be managed in separate database systems.
3.2	Contact information (name, email address, phone number, address) for the purposes of emergency notification. This list may expand as notification gaps are discovered.	*FIPPA* s. 26(c) Emergency Program Act s.6(2)[2] Local Authority Emergency Management Regulation s.2(3)(e)[3]	The personal information collected for this objective will be collected directly from the user. Users can voluntarily register for the Emergency Notification System. Location-based emergency notification, or partner notifications, will be opt-in.	The personal information will be used to provide relevant and timely notification of emergencies, and to build up and assess community emergency preparedness.	This information will not be disclosed to any third parties, unless it is necessary for the development and maintenance of the systems. Additionally, since the City Services are still managed in separate database systems, there will be no sharing of personal information between City departments, outside of standard business

[2] Emergency Program Act s.6(2), "...a local authority must prepare or cause to be prepared local emergency plans respecting preparation for, response to and recovery from emergencies and disasters"

[3] Local Authority Emergency Management Regulation s.2(3)(e), "...establish procedures by which those persons who may be harmed or who may suffer loss are notified of an emergency or impending disaster."

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Obj #	Personal Information Data Element	Legislative Authority	Collection	Use	Disclosure
					practices.
3.2	Contact information (name, email, postal code) to register for Let's Talk Richmond	*FIPPA* s. 26(c)	The personal information collected for this objective will be collected directly from the user. Users can voluntarily offer their thoughts and opinions through the City's Let's Talk Richmond system.	The personal information will be used for the purposes of administering the Let's Talk Richmond system.	This information will not be disclosed to any third parties, unless it is necessary for the development and maintenance of the systems. Additionally, since the City Services are still managed in separate database systems, there will be no sharing of personal information between City departments, outside of standard business practices.
3.2	Location data, for the purpose of geographical targeting of emergency notification	*FIPPA* s. 26(c) Emergency Program Act s.6(2) Local Authority Emergency Management Regulation s.2(3)(e)	The personal information collected for this objective will be collected directly from the user. Users can voluntarily register for the Emergency Notification System. Location-based emergency notification, or partner notifications, will be opt-in.	The personal information will be used to provide relevant and timely notification of emergencies.	This information will not be disclosed to any third parties, unless it is necessary for the development and maintenance of the systems. Additionally, since the City Services are still managed in separate database systems, there will be no sharing of personal information between City departments, outside of standard business

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Obj #	Personal Information Data Element	Legislative Authority	Collection	Use	Disclosure
					practices, except as stated in the answer to #6.
3.2	Program registration information, collected through the City's Perfectmind system	*FIPPA* s. 26(c) *FIPPA* s.26(e)[4]	The personal information collected for this objective will be collected directly from the user. Users can voluntarily register emergency preparedness training on offer by the City.	The personal information will be used to build up and assess community emergency preparedness. Where information about program registration, taken from Perfectmind, is used for analysis by Emergency Programs, users of the Perfectmind system will be notified of this use at the point of collection.	This information will not be disclosed to any third parties, unless it is necessary for the development and maintenance of the systems. Additionally, since the City Services are still managed in separate database systems, there will be no sharing of personal information between City departments, outside of standard business practices.
3.2	Opinions, questions, comments or concerns, collected through the City's Let's Talk Richmond system and social media channels	*FIPPA* s. 26(c) *FIPPA* s.26(e)	The personal information collected for this objective will be collected directly from the user. Users can voluntarily offer their thoughts and opinions through the City's Let's Talk Richmond system. Some personal information may be gathered from social media sources which are publically available on the	The personal information will be used for the purposes of administering the Let's Talk Richmond system, as well as to build up and assess community emergency preparedness.	This information will not be disclosed to any third parties, unless it is necessary for the development and maintenance of the systems, as per *FIPPA* s.33.1(e.1). Additionally, since the City Services are still managed in separate database systems,

[4] *FIPPA* s.26(e), "the information is necessary for the purposes of planning or evaluating a program or activity of a public body"

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Obj #	Personal Information Data Element	Legislative Authority	Collection	Use	Disclosure
			internet, for the purposes of assisting community emergency response and promoting emergency preparedness.		there will be no sharing of personal information between City departments, outside of standard business practices.
3.3	Device ID information for the purposes of providing wi-fi access	*FIPPA* s. 26(c)	Some personal information collected for this objective will be collected directly from the user, if they choose to use the services provided by the wayfinding stations.	The personal information collected will solely be used for the purpose of providing services to the users. It is not anticipated that device ID information will be stored long-term. It will be used for real-time notification and services.	Any personal information collected for this objective will not be disclosed or shared.
3.3	Device ID information for the purposes of charging smartphones	*FIPPA* s. 26(c)	Some personal information collected for this objective will be collected directly from the user, if they choose to use the services provided by the wayfinding stations.	The personal information collected will solely be used for the purpose of providing services to the users. It is not anticipated that device ID information will be stored long-term. It will be used for real-time notification and services.	Any personal information collected for this objective will not be disclosed or shared.
3.3	Device ID information of members of the public who are passing or standing at the smart kiosks, to determine location of those who might	*FIPPA* s. 26(c)	Device ID information might be collected indirectly from members of the public who are walking past or standing at the smart kiosks.	The personal information collected will solely be used for the purpose of providing services to the users. It is not anticipated that device ID information will be stored	Any personal information collected for this objective will not be disclosed or shared.

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	need emergency notifications			long-term. It will be used for real-time notification and services.	

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Smart Cities Challenge - Privacy Impact Assessment Questionnaire
1.1 Smart Streets

1	Describe what information may be collected, used or disclosed.
	The purpose of this objective is to use sensors and CCTV technology to create "Smart Streets," to decrease the rate of traffic incidents at intersections and implement machine learning algorithms for real-time traffic management system. This objective will be achieved by: • The instillation of CCTV cameras at 175 intersections, to increase traffic management capability, and to provide real time traffic information to City staff, first responders and the public • The instillation of LED motion sensitive lighting, high definition motion sensors, sound sensors, and Wi-Fi, to gather accurate vehicle, pedestrian and cyclist counts, linked to location and time/date information. **Personal Information being collected, used or disclosed for this objective includes:** • Video footage of vehicles, cyclists and pedestrians moving through the City's major intersections
2	If no personal information may be collected, please explain why
	Vehicle counting technology will record the speed and vehicle classification of the vehicle which has passed through the intersection, as well as location and time/date. This will not include the collection or storage of any unique identifiers of the vehicles, registered owners, or drivers, and thus, no personal information will be collected by these sensors. Other sensor data being collected, such as sound sensor data, will only record loudness and signal processing, and will not record any clear audio of members of the public as they pass through the intersections.
3	Describe the legal authority (if known) being used to collect, use or disclose personal information for this project. [Other than/in addition to the *Freedom of Information and Protection of Privacy Act* (FIPPA), is there any other legislation which authorizes the collection of personal information?]
	Legal authority is *FIPPA* s. 26(c), "the information relates directly to and is necessary for a program or activity of the public body". The City will also heavily rely on the OIPC's "Public Sector Surveillance Guidelines".
4	Include an Information Flow Map which outlines each collection, use or disclosure of personal information.
	See Smart Cities PIA Data Flow and Model and Data Collection Table, as attached to this Preliminary PIA.

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5	Describe from whom you will collect personal information from and the authority for that collection. This could be from individuals or project partners.
	Video surveillance data will be collected indirectly from individuals who move through the City's 175 signalized intersections.
6	Describe how you will use personal information being collected.
	Vehicle/pedestrian/cyclist count data to be used for traffic signal timing, long range transportation planning, traffic flows, traffic signal warrants, road improvement requirements, traffic-calming measures, speed studies. Video camera data to be used by • Traffic management staff • First responders for emergency preparedness - monitor emergency route availability and safety for first responders by enhancing response times. • RCMP – allows ability to investigate and utilize video as evidence for investigations, such as serious incidents • Pre-approved Authorities such as ICBC – traffic incident investigation
7	Describe to whom you will disclose personal information and how may this information be used by the third party.
	Traffic count data is open to consultants and the public. It can be used to forecast traffic pattern flows and transportation planning. Video camera footage may be made available to RCMP and ICBC, for specific investigations.
8	Describe how you will collect meaningful consent from individuals whose personal information is being collected, used or disclosed.
	It will not be possible to obtain consent from individuals, as the information is collected indirectly from members of the public. However the City will ensure proper notification of the collection, through signage and other public awareness means.
9	Describe how you will ensure the security of any personal information being collected, used or disclosed.
	See Smart Cities PIA Data Flow and Model Video data will be securely stored on a server for a reasonable period of time (e.g. one month). The data will be destroyed after the holding period. Only data requested by the appropriate authorities, such as ICBC, or archived for investigative purposes will be forwarded onto the investigating authority for retention under the terms of relevant legislation (Public Sector Surveillance Guidelines).
10	Describe who will own and control the personal information being collected, used or disclosed. Describe how you will avoid private-sector ownership to the best of your

	ability.
	Video data will be securely stored on City servers.
11	Describe what measures you will take to ensure data minimization and de-identification of all personal information, and mitigation of potential for re-identification.
	The City will follow the OIPC's "Public Sector Surveillance Guidelines" for best practices. Additionally, it will seek out camera technology which will limit or prevent the collection of personal information.
12	Describe any opportunities for the data collected for your project to be provided openly and transparently to the public.
	Traffic count data is open to consultants and the public. It can be used to forecast traffic pattern flows and transportation planning.
13	Describe the risks associated with the open data collection, the potential impacts and what the mitigation plan could be.
	None.

Smart Cities Challenge - Privacy Impact Assessment Questionnaire
1.2 Sustainable Transportation

1	Describe what information may be collected, used or disclosed.
	The purpose of this objective is to create mobility hubs which would include electric vehicle charging infrastructure, access to shared cars and bikes, and transit services. This would include: • Electrical Vehicle ("EV") charging stations • Parking or loading spaces for car-share, taxi or ride-hailing services • Dynamic parking management system • Bike share and bike parking • Transit/HandyDART stops and shelters • Free public wi-fi, and solar powered lighting where smart kiosks are located • Use of an open platform or app which would display where and what mobility hub assets are available • Pedestrian and bicycle counters to track active transportation trips This objective will be achieved by using the following technologies: • Public EV charging infrastructure • Dynamic parking network management systems • Electrical load sharing management system • Improved grid and electrical infrastructure capacity in select locations • Heavy duty electric vehicle charging infrastructure • Inductive loops and infrared technology to count cyclists and pedestrians respectively • Renewable energy systems **Personal information being collected, used or disclosed for this objective includes:** • Information regarding electrical charging transaction, usage and location, linked through a unique ID and provided to the City by a third party vendor, Chargepoint, for the purposes of tracking overall usage of the system, and to identify whether the vehicle was a public vehicle or City vehicle, for the purposes of billing • Device ID information for the purposes of providing wi-fi access (please see questionnaire for 3.3 for more information regarding the provision of free public wi-fi)
2	If no personal information may be collected, please explain why
	Not applicable. Information regarding a public bike share transaction, gathered from the third party vendor, U-Bicycle, regarding trip date and time, trip origin and destination, and trip duration, is collected by the City for statistical purposes. This information is de-identified

	with the account holder and thus is not considered personal information for the purposes of this Preliminary PIA.
3	Describe the legal authority (if known) being used to collect, use or disclose personal information for this project. [Other than/in addition to the *Freedom of Information and Protection of Privacy Act* (FIPPA), is there any other legislation which authorizes the collection of personal information?]
	Legal authority is *FIPPA* s. 26(c), "the information relates directly to and is necessary for a program or activity of the public body"
4	Include an Information Flow Map which outlines each collection, use or disclosure of personal information.
	See Smart Cities PIA Data Flow and Model and Data Collection Table, as attached to this Preliminary PIA.
5	Describe from whom you will collect personal information from and the authority for that collection. This could be from individuals or project partners.
	For electrical charging transactions, the City will be using a third party vendor, Chargepoint, to administer billing services. Chargepoint collects transaction information, some of which is shared with the City. This information is collected directly from those who sign up for the service.
6	Describe how you will use personal information being collected.
	The personal information collected will solely be used for the purpose of providing services to the users. Some information regarding charging transactions will be shared with the City by Chargepoint, for the purpose of identifying whether the vehicle using the charging station is a City vehicle or a public vehicle. The information may also be anonymized and compiled for statistical purposes.
7	Describe to whom you will disclose personal information and how may this information be used by the third party.
	Anonymized information regarding electrical charging station usage, pedestrian or bicycle counts, or parking spot vacancies, could be shared with the public. No information which could be connected to an individual will be shared outside of the City and Chargepoint.
8	Describe how you will collect meaningful consent from individuals whose personal information is being collected, used or disclosed.
	Customers are required to create a Chargepoint account for the use electrical charging services. The City will ensure that through their relationship with Chargepoint, consent is collected at the point of account registration.
9	Describe how you will ensure the security of any personal information being collected, used or disclosed.
	See Smart Cities PIA Data Flow and Model

10	**Describe who will own and control the personal information being collected, used or disclosed. Describe how you will avoid private-sector ownership to the best of your ability.**
	Use of the electrical charging stations will require customers to sign up for a Chargepoint account. Thus, the personal information in the custody and control of the City will be provided from Chargepoint. Only information relating to the transaction will be shared – unique account id, amount of electricity used, and location. The City will not be providing any personal information to Chargepoint.
11	**Describe what measures you will take to ensure data minimization and de-identification of all personal information, and mitigation of potential for re-identification.**
	The minimum amount of personal information will be collected for this objective.
12	**Describe any opportunities for the data collected for your project to be provided openly and transparently to the public.**
	The City anticipates that statistical information regarding the usage of the Mobility Hubs could be provided openly and transparently to the public, including: • How many charging sessions used • How much energy is dispensed • Location and time of day data • Emissions reporting • Etc
13	**Describe the risks associated with the open data collection, the potential impacts and what the mitigation plan could be.**
	Any data which might be made open to the public will be reviewed to ensure it is aggregated and anonymized, and unable to be traced back to an individual transaction.

Smart Cities Challenge - Privacy Impact Assessment Questionnaire
2.1 Integrated Smart Alerts and Post-Disaster Assessment

1	Describe what information may be collected, used or disclosed.

	The purpose of this objective is to use smart technology to detect emergency incidents and assess damage of assets.
	
	The objective will be achieved by the following:
	• Identifying and increasing the number of sensors available, such as
	  ○ Pressure and temperature sensors
	  ○ Flow meters
	  ○ Pumpstations and level sensors
	  ○ River-level sensors
	  ○ Water meters – residential and bulk
	  ○ Rainfall gauges
	  ○ Road temperature sensors
	  ○ Camera systems and drones
	• Using machine learning to help decision making and to forecast/mitigate disaster impacts
	
	Personal information being collected, used or disclosed for this objective includes:
	• Video footage captured by public/private camera systems and deployed drones, which may include personal information.
	• Water meter location and water usage statistics

2	If no personal information may be collected, please explain why
	The majority of the sensor information collected for this objective will not contain or be linked to personal information.
3	Describe the legal authority (if known) being used to collect, use or disclose personal information for this project. [Other than/in addition to the *Freedom of Information and Protection of Privacy Act* (FIPPA), is there any other legislation which authorizes the collection of personal information?]
	Legal authority is *FIPPA* s. 26(c), "the information relates directly to and is necessary for a program or activity of the public body".
4	Include an Information Flow Map which outlines each collection, use or disclosure of personal information.
	See Smart Cities PIA Data Flow and Model and Data Collection Table, as attached to this Preliminary PIA.
5	Describe from whom you will collect personal information from and the authority for that collection. This could be from individuals or project partners.

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	Video surveillance data for the purposes of damage assessment may be collected indirectly from individuals whose images may be caught in the footage. Water meter data, which includes location and usage only, would be provided to the City by third party vendor Neptune.
6	**Describe how you will use personal information being collected.**
	Video surveillance data will be used to assess damage to buildings and City property after a disaster. Water meter data will be used to flag properties where significant damage may have occurred, i.e. if the meter goes offline or the usage spikes significantly (which may signify a major leak).
7	**Describe to whom you will disclose personal information and how may this information be used by the third party.**
	Personal information collected for this objective will not be shared. Any information which might be shared will be depersonalized before sharing, either at the point of collection, or through processing.
8	**Describe how you will collect meaningful consent from individuals whose personal information is being collected, used or disclosed.**
	It will not be possible to obtain consent from individuals, as the information is collected indirectly from members of the public. However the City will ensure proper notification of the collection, through signage and other public awareness means.
9	**Describe how you will ensure the security of any personal information being collected, used or disclosed.**
	See Smart Cities PIA Data Flow and Model
10	**Describe who will own and control the personal information being collected, used or disclosed. Describe how you will avoid private-sector ownership to the best of your ability.**
	All data collected will remain under the control of the City of Richmond.
11	**Describe what measures you will take to ensure data minimization and de-identification of all personal information, and mitigation of potential for re-identification.**
	The City will seek out camera technology which will limit or prevent the collection of personal information. Water meter data used for post-disaster assessment will not be linked with property owners or individual accounts.
12	**Describe any opportunities for the data collected for your project to be provided openly and transparently to the public.**
	Water pressure, drainage water level, sanitary sewer water level, and air quality

	information could be provided to the public. While air quality information has some value to the public, water pressure, etc may not be interesting to the public.
13	**Describe the risks associated with the open data collection, the potential impacts and what the mitigation plan could be.**
	There are no tangible risks to publishing water pressure, drainage water level, sanitary sewer water level and air quality information. All of this information is currently available on an FOI basis. The City currently publishes water levels outside of the dike on the City's web site and there have not been any negative repercussions to date.

Smart Cities Challenge - Privacy Impact Assessment Questionnaire
2.2 Renewable Energy Source for Emergency Assets

1	Describe what information may be collected, used or disclosed.
	The purpose of this objective is to equip public infrastructure with renewable power to function for 72 hours when the central electrical grid is compromised. This objective will be achieved by identifying opportunities and feasibility of renewable power generators for public assets. Sensor data will be collected regarding the function of these power supplies, to be fed into an energy dashboard for the Integrated Municipal Operations HUB. There is no personal information being collected, used or disclosed for this objective.
2	If no personal information may be collected, please explain why
	The objective relates solely to establishing emergency power infrastructure and does not require the collection, use or disclosure of personal information.
3	Describe the legal authority (if known) being used to collect, use or disclose personal information for this project. [Other than/in addition to the *Freedom of Information and Protection of Privacy Act* (FIPPA), is there any other legislation which authorizes the collection of personal information?]
	Not applicable.
4	Include an Information Flow Map which outlines each collection, use or disclosure of personal information.
	Not applicable.
5	Describe from whom you will collect personal information from and the authority for that collection. This could be from individuals or project partners.
	Not applicable.
6	Describe how you will use personal information being collected.
	Not applicable.
7	Describe to whom you will disclose personal information and how may this information be used by the third party.
	Not applicable.
8	Describe how you will collect meaningful consent from individuals whose personal information is being collected, used or disclosed.
	Not applicable.
9	Describe how you will ensure the security of any personal information being collected,

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	used or disclosed.
	Not applicable.
10	Describe who will own and control the personal information being collected, used or disclosed. Describe how you will avoid private-sector ownership to the best of your ability.
	Not applicable.
11	Describe what measures you will take to ensure data minimization and de-identification of all personal information, and mitigation of potential for re-identification.
	Not applicable.
12	Describe any opportunities for the data collected for your project to be provided openly and transparently to the public.
	Not applicable.
13	Describe the risks associated with the open data collection, the potential impacts and what the mitigation plan could be.
	Not applicable.

Smart Cities Challenge - Privacy Impact Assessment Questionnaire
2.3 Integrated Municipal Operations HUB : Physical and Digital

1	Describe what information may be collected, used or disclosed.
	The purpose of this objective is to create an every day operation centre to manage City operations and integrate cross-functional data collected to seamlessly transition to an emergency operations centre. This objective will be achieved by: • Creating a well-designed and functional physical setting for an Operations HUB • Working with partner agencies with similar functions and mandates to ensure communication protocols (see 3.2) and protocols are in place and integrated • Integrating data collection points from other objectives (see 1.1, 1.2, 2.1, 2.2, 3.1, 3.2, and 3.3)into a virtual Operations HUB • Creating a mobile application/dashboard to display data for both internal City staff and external partners to ensure decisions can be made offsite when needed The scope of the integration will develop as the project is implemented. The Preliminary PIA will be reviewed as the scope is finalized to ensure the information contained here remains accurate.
2	If no personal information may be collected, please explain why
	The Integrated Municipal Operations HUB dashboard will collect, use and disclose the following categories of data: • Raw sensor data, to be shared only internally ○ Raw sensor data, such as video from traffic cameras, will be de-personalized at either the point of collection (the camera itself) or once it is processed by the Event Hub Data Collection. The Integrated Municipal Operations HUB will not receive traffic camera footage which has not been depersonalized • Sensor data which has been aggregated through machine learning algorithms to be non-specific and anonymized, to be shared externally • Insights and actions taken based on the data collected, which will not include personal information. The intention is that no personal information will be shared internally with staff who do not need this information (this is consistent with current City practices), or externally with partner agencies. The dashboard will also govern what data partner agencies can view, depending on the individual information sharing agreements. Each information sharing agreement will be reviewed by the City Clerk's Office to ensure that data elements shared are clearly identified and is in compliance with FIPPA.

	Day to day operations, which will include Work Control Centre, Traffic Control, Emergency Programs, and Fire, conducted at the physical Integrated Municipal Operations HUB, will continue to use current or to-be-developed database systems, which will remain separate and distinct. Those databases will not integrate through the virtual dashboard, and will not be shared with outside partners. If further integration is required of these systems, then a PIA will be conducted. For specific information regarding the raw and aggregated sensor data, please consult the questionnaires of other project objectives.
3	Describe the legal authority (if known) being used to collect, use or disclose personal information for this project. [Other than/in addition to the *Freedom of Information and Protection of Privacy Act* (FIPPA), is there any other legislation which authorizes the collection of personal information?]
	Not applicable.
4	Include an Information Flow Map which outlines each collection, use or disclosure of personal information.
	Not applicable.
5	Describe from whom you will collect personal information from and the authority for that collection. This could be from individuals or project partners.
	Not applicable.
6	Describe how you will use personal information being collected.
	Not applicable.
7	Describe to whom you will disclose personal information and how may this information be used by the third party.
	Any sensor information be shared with project partners will be aggregated and anonymized before sharing, so it is not anticipated that personal information will be shared with third parties. Additionally, all information sharing with third parties will be covered by Information Sharing Agreements.
8	Describe how you will collect meaningful consent from individuals whose personal information is being collected, used or disclosed.
	Not applicable.
9	Describe how you will ensure the security of any personal information being collected, used or disclosed.
	Not applicable.
10	Describe who will own and control the personal information being collected, used or

	disclosed. Describe how you will avoid private-sector ownership to the best of your ability.
	Not applicable.
11	Describe what measures you will take to ensure data minimization and de-identification of all personal information, and mitigation of potential for re-identification.
	No personal information is being collected, used or disclosed. All sensor information collected through the HUB and displayed through the dashboard will be aggregated data, and filtered via machine learning. It will be considered "ready to share".
12	Describe any opportunities for the data collected for your project to be provided openly and transparently to the public.
	As the Integrated Municipal HUB dashboard contains data and information which is aggregated, anonymized, and "ready to share", there may be further opportunities to share information with other organizations, municipalities, or the public. It is anticipated that further partners will be given access to this data over time.
13	Describe the risks associated with the open data collection, the potential impacts and what the mitigation plan could be.
	The information collected and displayed through the virtual dashboard is primarily for the purposes of open communication and opportunities with other interested parties for the purposes of improved emergency response. Aggregated and anonymized data will be shared with these partners, and it is possible the City will draw on open data sources from these partners as well. Potential impacts could involve misuse of the information gathered and displayed. Information Sharing Agreements will need to be produced with each partner in order to mitigate the City's risk, and to determine the scope and terms of the information being shared between the City and those partners. A further mitigation could involve allowing open access to the dashboard for the public.

Smart Cities Challenge - Privacy Impact Assessment Questionnaire
3.1 MyRichmond

1	Describe what information may be collected, used or disclosed.
	The purpose of this objective is to expand the functionality of MyRichmond with an emphasis on preparing the community for emergency response. MyRichmond is a City services web portal which allows customers to see all City services relevant to their needs and interests in one place. Customers do this by creating a MyProfile, using their name and email address. Customers can choose to register their date of birth, phone numbers, and mailing address. They can also choose to link their accounts from different City systems by using their unique identifier from each system. The data from these disparate systems is presented to the customer through MyRichmond after passing through the Digital Nervous Ecosystem ("DNE"). The customer's data remains in the separate systems. Currently, the following City services can be linked into the personal dashboard of customers through MyRichmond: • MyVoice (Customer Feedback System) • Property Tax and Utilities Billing (Tempest) • Homeowner Grant Applications (Tempest) • Garbage and Recycling Collection Schedule (Recollect) • Dog Licences (Tempest) • Activity and Program Registrations (Class, soon to be migrated to PerfectMind) There are also links to services elsewhere on the City's website: • Calendar of Events • Events Permitting Applications • City Grant Applications The expansion of MyRichmond, as envisioned by the Smart Cities Challenge objective, will include: • Emergency Management Information System (EMIS) • Family Emergency Planning Database • Emergency Notification System • Business Licenses Application and Renewal (Tempest) • Richmond Interactive Map • ICanHelp Volunteer Management • Let's Talk Richmond, a Community Engagement Tool • Online Public Notifications Delivery System

	This expansion will also include a new view through the MyRichmond portal, "MyBusiness." MyBusiness will allow businesses to complete their business license applications and access emergency planning resources. Businesses will also be encouraged to share information with the community regarding any resources they are able to provide during an emergency. These services will connect to MyRichmond through the Digital Nervous Ecosystem through the unique identifier for each customer (likely email address, license number, etc). The data about a customer will remain in their separate systems. Therefore, a customer's data will only be linked through their view of each system in MyRichmond. They will not be linked anywhere else. A Privacy Impact Assessment for MyRichmond has been drafted, current to March 2018. A Privacy Impact Assessment for Perfectmind is currently being drafted, in anticipation of its launch in early 2019. A Privacy Impact Assessment was drafted for the Emergency Notification System in 2016. **Personal information being collected, used or disclosed for this objective includes:** • Data elements necessary for the creation of a MyProfile (name, email address, home address, birthdate, unique identifiers for linked City systems, etc) • Location services data of a user's cell phone, facilitated through third party mapping applications (Google Maps, Apple maps, etc), in order to present a user with the location of nearby resources, events and services • Home address or location services data of a user's cell phone, to provide "geofenced" emergency notifications on an opt-in basis • Data elements related to the development of a Family Emergency Plan • Data elements related to the reporting of damage during an emergency, to be filtered to the Emergency Management Information System (EMIS) All other personal information collected, used, or disclosed for the City services will be kept per the terms of those individual systems. When further systems are linked to MyRichmond, the City will review the Privacy Impact Assessment for MyRichmond to ensure that privacy continues to be protected in those systems and through the linkages as they are created.
2	If no personal information may be collected, please explain why
	Not applicable.
3	Describe the legal authority (if known) being used to collect, use or disclose personal information for this project. [Other than/in addition to the *Freedom of Information and Protection of Privacy Act* (FIPPA), is there any other legislation which authorizes the collection of personal information?]
	Legal authority is *FIPPA* s. 26(c), "the information relates directly to and is necessary for a

	program or activity of the public body"
4	**Include an Information Flow Map which outlines each collection, use or disclosure of personal information.**
	See Smart Cities PIA Data Flow and Model and Data Collection Table, as attached to this Preliminary PIA.
5	**Describe from whom you will collect personal information from and the authority for that collection. This could be from individuals or project partners.**
	The personal information collected for the MyProfile, which allows access to MyRichmond, is collected directly from the customer. The system is optional for use, and customers can also choose which City service to link with their MyProfile account. The legal authority is *FIPPA* s. 26(c), "the information relates directly to and is necessary for a program or activity of the public body"
6	**Describe how you will use personal information being collected.**
	The personal information will be used for the purposes of providing the single sign-on, one stop customer services view through MyRichmond, or in order to receive emergency notifications based on user location (either through home address, or cell phone location). The use of personal information for this purpose will be clearly stated through the online consent form.
7	**Describe to whom you will disclose personal information and how may this information be used by the third party.**
	This information will not be disclosed to any third parties outside of service provider or consultant relationships established for the maintenance of the systems, where they act as agents of the City and the information sharing is managed though agreements. City Services will still be managed in separate database systems.
8	**Describe how you will collect meaningful consent from individuals whose personal information is being collected, used or disclosed.**
	Consent is collected when registering and interfacing with the MyRichmond app.
9	**Describe how you will ensure the security of any personal information being collected, used or disclosed.**
	See Smart Cities PIA Data Flow and Model
10	**Describe who will own and control the personal information being collected, used or disclosed. Describe how you will avoid private-sector ownership to the best of your ability.**
	The City of Richmond will own all data collected for this objective, including personal information.
11	**Describe what measures you will take to ensure data minimization and de-identification of all personal information, and mitigation of potential for re-identification.**

	MyRichmond uses the Digital Nervous Ecosystem in order to link disparate City database systems to the customer. In order to provide services to individuals, the data cannot be de-identified. Each database remains a separate system, and are not linked. They are only linked through the unique identifiers, provided by the customer. This minimizes risk to the customer.
12	**Describe any opportunities for the data collected for your project to be provided openly and transparently to the public.**
	There are no open data opportunities with this objective. However MyRichmond will be used as a tool to access other publically available data, for instance using the Richmond Interactive Map to locate City resources.
13	**Describe the risks associated with the open data collection, the potential impacts and what the mitigation plan could be.**
	Not applicable.

Smart Cities Challenge - Privacy Impact Assessment Questionnaire
3.2 Integrated Communication Tools

1	Describe what information may be collected, used or disclosed.
	The purpose of this objective is to use technology to increase communication with partners and the public for the purpose of emergency preparedness and emergency notification. The objective will be achieved by the following: • Identifying current communication tools in use by the City and how they can be integrated with partner communication tools, for the purpose of public notification • Identifying communication tools which can be used between the City and Partner Agencies (such as Jabber), to allow for notifications to reach wider audiences • Assessing community emergency preparedness through public engagement and research (partnering with Kwantlen Polytechnic) • Developing new training tools, including new communication tools, for use with the MyRichmond platform • Developing a system of "targeted alerts", by sending emergency notification to users based on their location, both home address and cell location • Increasing public interaction on online platforms, utilizing Let's Talk Richmond and social media • Integrating training resources with other departments and partners, such as Fire Life Safety, Block Watch, and Richmond Resilient Communities • Increased use of the City's social media, mobile apps and other crowd sourcing technologies to gather information to help guide emergency response and assess areas of greatest need, for example to identify where assistance is needed throughout the City • Implementing the Richmond Emergency Management Information System, and upgrading the current Richmond Emergency Notification System • Developing and implementing Family Emergency Planning Database, to use through the MyRichmond web platform • Inventorying and assessing available technology to translate on demand, including on mobile devices for first responders and other staff • Inventorying and assessing available technology to ensure accessible communication for people in isolated communities A Privacy Impact Assessment was drafted for the Emergency Notification System in 2016. A Privacy Impact Assessment for Perfectmind is currently being drafted, in anticipation of its launch in early 2019. **Personal information being collected, used or disclosed for this objective includes:**

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	• Contact information (name, email address, phone number, address) for the purposes of emergency notification. This list may expand as notification gaps are discovered. • Contact information (name, email, postal code) to register for Let's Talk Richmond • Location data, for the purpose of geographical targeting of emergency notification • Program registration information, collected through the City's Perfectmind system • Analysis of program registration information from the City's Perfectmind system, to research how resilient communities within the City are, based on mapping the home addresses of Emergency Preparedness training registrants • Opinions, questions, comments or concerns, collected through the City's Let's Talk Richmond system and social media channels It is not anticipated that any personal information collected for this objective will be shared with any external partners. There is an opportunity to integrate notifications with partners, however it is not anticipated that the contact information for users will be shared with partners, solely the public message itself.
2	If no personal information may be collected, please explain why
	Not applicable.
3	Describe the legal authority (if known) being used to collect, use or disclose personal information for this project. [Other than/in addition to the *Freedom of Information and Protection of Privacy Act* (FIPPA), is there any other legislation which authorizes the collection of personal information?]
	Legal authority is as follows: • *FIPPA* s. 26(c), "the information relates directly to and is necessary for a program or activity of the public body" • *FIPPA* s.26(e), "the information is necessary for the purposes of planning or evaluating a program or activity of a public body" • Emergency Program Act s.6(2), "...a local authority must prepare or cause to be prepared local emergency plans respecting preparation for, response to and recovery from emergencies and disasters: • Local Authority Emergency Management Regulation s.2(3)(e), "...establish procedures by which those persons who may be harmed or who may suffer loss are notified of an emergency or impending disaster."
4	Include an Information Flow Map which outlines each collection, use or disclosure of personal information.
	See Smart Cities PIA Data Flow and Model and Data Collection Table, as attached to this Preliminary PIA.
5	Describe from whom you will collect personal information from and the authority for that collection. This could be from individuals or project partners.

	The personal information collected for this objective will be collected directly from the user. Users can voluntarily register for the Emergency Notification System and any emergency preparedness training on offer by the City, as well as offer their thoughts and opinions through the City's Let's Talk Richmond system. Location-based emergency notification, or partner notifications, will be opt-in. Some personal information may be gathered from social media sources which are publically available on the internet, for the purposes of assisting community emergency response and promoting emergency preparedness.
6	**Describe how you will use personal information being collected.**
	The personal information will be used to provide relevant and timely notification of emergencies, and to build up and assess community emergency preparedness. Where information about program registration, taken from Perfectmind, is used for analysis by Emergency Programs, users of the Perfectmind system will be notified of this use at the point of collection.
7	**Describe to whom you will disclose personal information and how may this information be used by the third party.**
	This information will not be disclosed to any third parties, unless it is necessary for the development and maintenance of the systems, as per *FIPPA* s.33.1(e.1) "an individual who is a service provider to the public body, or an employee or associate of such a service provide [and] the information is necessary for the performance of the duties of the individual in relation to the public body". Additionally, since the City Services are still managed in separate database systems, there will be no sharing of personal information between City departments, outside of standard business practices, except as stated in the answer to #6.
8	**Describe how you will collect meaningful consent from individuals whose personal information is being collected, used or disclosed.**
	Consent is collected when initially registering with the relevant City systems: • Richmond Emergency Notification System • Perfectmind • Let's Talk Richmond Each system is completely voluntary. Any personal information which may be collected through social media channels will sourced from publically available information.
9	**Describe how you will ensure the security of any personal information being collected, used or disclosed.**

	See Smart Cities PIA Data Flow and Model
10	Describe who will own and control the personal information being collected, used or disclosed. Describe how you will avoid private-sector ownership to the best of your ability.
	The City of Richmond will own and control all data collected for this objective, including personal information.
11	Describe what measures you will take to ensure data minimization and de-identification of all personal information, and mitigation of potential for re-identification.
	The minimum amount of personal information will be collected for this objective.
12	Describe any opportunities for the data collected for your project to be provided openly and transparently to the public.
	There are no open data opportunities with this objective.
13	Describe the risks associated with the open data collection, the potential impacts and what the mitigation plan could be.
	Not applicable.

Smart Cities Challenge - Privacy Impact Assessment Questionnaire
3.3 Smart Way-Finding Solutions

1	Describe what information may be collected, used or disclosed.

	The purpose of this objective is to identify and develop a wayfinding strategy for every day and emergency use. Wayfinding infrastructure will allow residents and visitors to receive notifications and directions in the case of an emergency.
	
	The objective will be achieved by:
	• Identifying existing and planned wayfinding infrastructure
	• Identifying digitally enabled wayfinding infrastructure options to incorporate into street furniture design, "smart kiosks" including the capabilities for:
	  ○ Wi-fi access
	  ○ USB Connections for charging smart phones
	  ○ Charging stations for electric bikes
	  ○ Other information services
	• Identifying a mapping system, potentially using the Richmond Interactive Map (RIM) for wayfinding content on the an app and signage (This app might be MyRichmond, or a stand-alone app which does not require registration)
	• Connecting the following:
	  ○ Wayfinding end points
	  ○ Richmond owned assets and facilities
	  ○ Third party bus shelters
	  ○ Third party transit displays
	• Creating an inventory of digital screens and message boards at City facilities
	• Identifying partner agencies, both public and private who can provide access to digital screens for notification purposes
	
	Personal information being collected, used or disclosed for this objective includes:
	• Device ID information for the purposes of providing wi-fi access
	• Device ID information for the purposes of charging smartphones
	• Device ID information of members of the public who are passing or standing at the smart kiosks, to determine location of those who might need emergency notifications

2	If no personal information may be collected, please explain why
	Not applicable.
3	Describe the legal authority (if known) being used to collect, use or disclose personal information for this project. [Other than/in addition to the *Freedom of Information and Protection of Privacy Act* (FIPPA), is there any other legislation which authorizes the collection of personal information?]

	Legal authority is as follows: • *FIPPA* s. 26(c), "the information relates directly to and is necessary for a program or activity of the public body" • Emergency Program Act s.6(2), "...a local authority must prepare or cause to be prepared local emergency plans respecting preparation for, response to and recovery from emergencies and disasters: • Local Authority Emergency Management Regulation s.2(3)(e), "...establish procedures by which those persons who may be harmed or who may suffer loss are notified of an emergency or impending disaster."
4	**Include an Information Flow Map which outlines each collection, use or disclosure of personal information.**
	See Smart Cities PIA Data Flow and Model and Data Collection Table, as attached to this Preliminary PIA.
5	**Describe from whom you will collect personal information from and the authority for that collection. This could be from individuals or project partners.**
	Some personal information collected for this objective will be collected directly from the user, if they choose to use the services provided by the wayfinding stations. Device ID information might be collected indirectly from members of the public who are walking past or standing at the smart kiosks.
6	**Describe how you will use personal information being collected.**
	The personal information collected will solely be used for the purpose of providing services to the users. It is not anticipated that device ID information will be stored long-term. It will be used for real-time notification and services.
7	**Describe to whom you will disclose personal information and how may this information be used by the third party.**
	Any personal information collected for this objective will not be disclosed or shared.
8	**Describe how you will collect meaningful consent from individuals whose personal information is being collected, used or disclosed.**
	Consent will be obtained from users when they elect to use the wifi or charging services provided by the wayfinding station. The public will also be notified of indirect collection of their device ID information when they are walking past or standing at the smart kiosks.
9	**Describe how you will ensure the security of any personal information being collected, used or disclosed.**

	See Smart Cities PIA Data Flow and Model
10	Describe who will own and control the personal information being collected, used or disclosed. Describe how you will avoid private-sector ownership to the best of your ability.
	The City of Richmond will own and control all data collected for this objective, including personal information.
11	Describe what measures you will take to ensure data minimization and de-identification of all personal information, and mitigation of potential for re-identification.
	The minimum amount of personal information will be collected for this objective.
12	Describe any opportunities for the data collected for your project to be provided openly and transparently to the public.
	Richmond Interactive Map data is already available to the public.
13	Describe the risks associated with the open data collection, the potential impacts and what the mitigation plan could be.
	Not applicable.

Smart Cities– PIA Data flow and model

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1 Overview

Data flow and model for Smart Cities Challenge Privacy Impact Assessment.
Information current as of November 20, 2018.
Full architecture available at REDMS #6006049 (Visio diagrams).

1.1 Example data flow through the entire architecture

Input data from sensors on light posts, in the roads, at traffic intersections, at bus shelters, on the dykes, etc are transmitted through radio signals (cellular, wifi) or wires (fibre, copper) over a virtual private network (VPN) to the City's data centres (on-premise and in Canadian cloud). Some sensors may send their data first to a collecting radio tower and the radio tower would transmit collected data to the City's data centres.

Once at the data centres and in the Digital Nervous Ecosystem (DNE), the data are marshalled into a data lake. DNE would add to the data lake any line of business applications (LOB) data that are required to compute metrics to be displayed at the operations hub and useful to machine learning training. Example of LOB data that are used to compute metrics would be number of city assets, emergency incident counts, and city vehicles in deployment. The DNE also add to the data lake data from public or partner organizations' systems that would be useful for aggregation, machine learning training, and further dissemination. Examples of public data include weather information, tide information etc. Examples of partner organizations data would include seismic activity data, emergency incidents in other municipalities, highway and bridges traffic data.

The data lake is the "memory" of the "thinking" part of the DNE. The data lake acts as a source of data for data scientists to explore algorithms and relationships that are useful to building machine learning models used to predict incidents, maintenance schedules, and demands on city services etc. Data engineers also work on the data lake to clean up data and convert them into formats more easily consumed by the rest of the DNE. The data lake is also a participant to real-time machine learning by acting as a source for ML models. Finally, the data lake is a source for visualization onto business intelligence dashboards to allow operation centre staff to deduce insight. The "thinking" part of the DNE includes components to perform machine learning on-the-fly (think of it as on-the-job-training for a machine), and analyse data to be presented in a form that help decision-makers make correct decisions quickly.

Some data arriving at the data centres are used for immediate display, real-time machine learning, and triggering alert notifications. These data are given priority and are consumed by the real-time components of the DNE even while they are making their way to the data lake.

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The real-time components of DNE focus on distilling important data quickly and feeding them for other systems for immediate action. It is the human equivalent of the hand being able to pull away from the hot stove quickly. This part of the DNE must execute as quickly as possible to push out alerts and actions.

The alerts, visualizations, predictions, etc coming from the thinking and real-time part of the DNE are communication to operational decision-makers through visual dashboards, alerts on work computers/mobile devices, and specialized LOB applications like WebEOC, IPS, ArcGIS etc. In additional to these channels of communications, DNE shares data with partner operation centres through data sharing virtual private networks over the internet. DNE also communicates to the public directly through visual dashboards, the MyRichmond app/website, road signs (with the help of LOB signage system), etc. In an emergency situation, DNE can broadcast City alerts to partners' broadcast systems so that those partners can further propagate the alerts to their audience.

2 Smart Streets (1.1)

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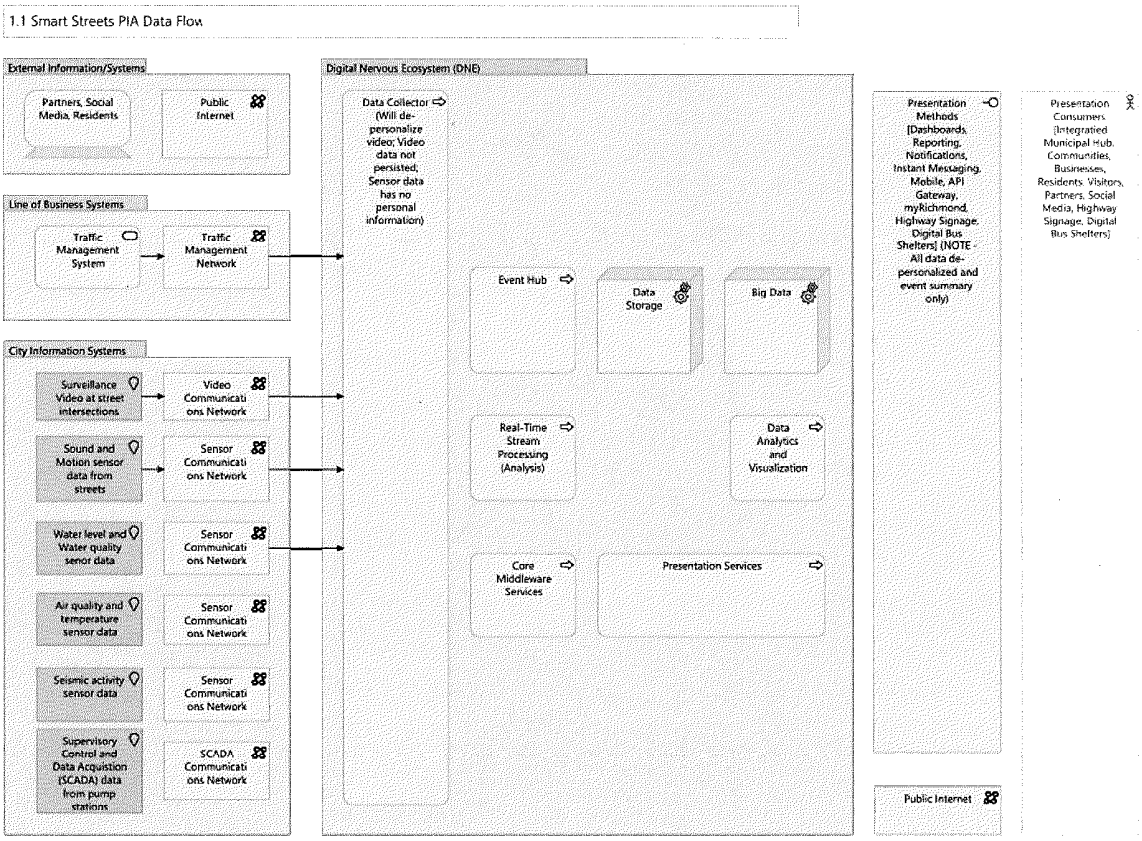
2.1 Data flow diagram



2.2 Data flow and Data classification

Data Classification Matrix

The following table documents the data collected:

	Data	Data Classification	Purpose	Data Steward
1.	Surveillance video	Sensor data	To detect congestion, traffic incidents for: - improving traffic planning, emergency response time - sharing congestion and route information with the public	IT

	Data	Data Classification	Purpose	Data Steward
2.	Sound sensor audio (loudness and signal processing only)	Sensor data	To detect congestion, traffic incidents for: - improving traffic planning, emergency response time - sharing congestion and route information with the public	IT
3.	Non-personal-identifiable sensor data (motion, water level)	Sensor data	To detect congestion, traffic incidents for: - improving traffic planning, emergency response time - sharing congestion and route information with the public	IT

Surveillance video

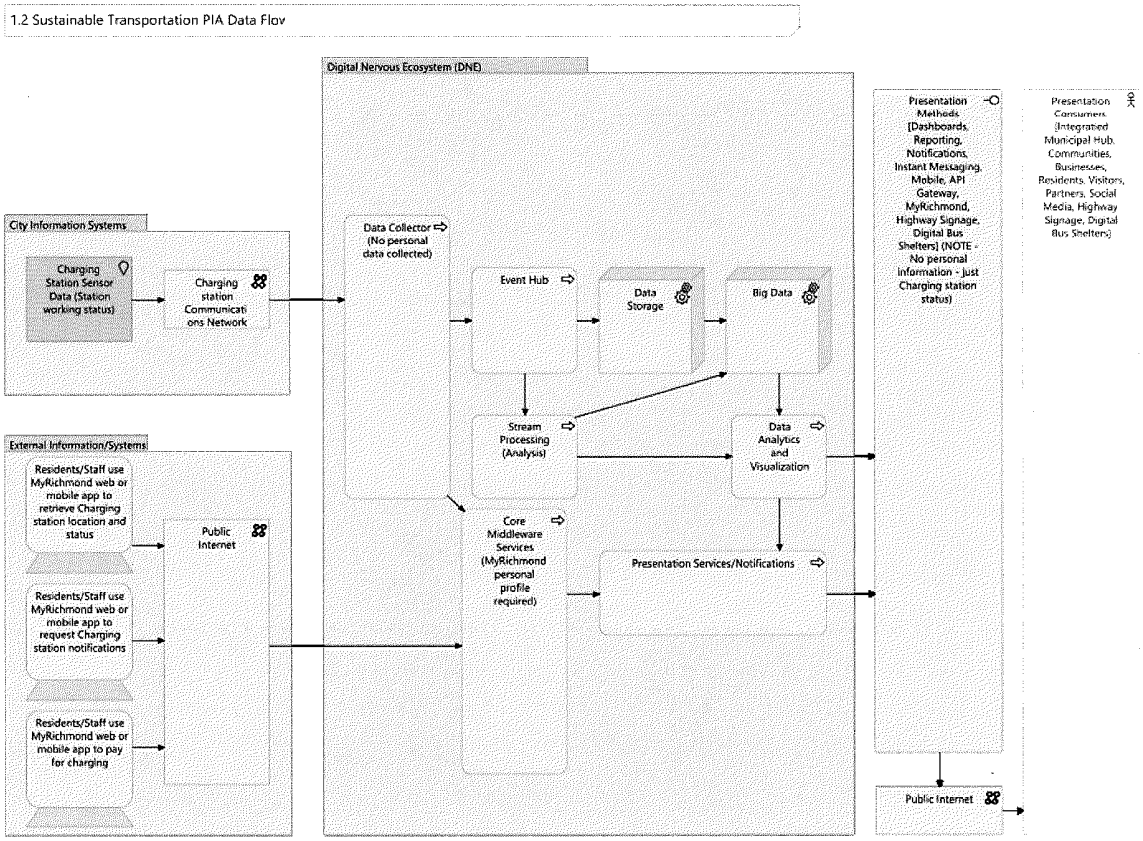
1. Sensor video data is collected by cameras. Video data is de-personalized for some cameras depending on camera make.
2. Sensor video data moves to Data Collection and then to Event Hubs Data Collection and Event Hub will both be on-premise and in the cloud. Access to Data Collection and Event Hub will be tightly controlled. Data are not persisted in Data Collection and Event Hub. Data Collection will de-personalize video data that has not yet been de-personalized by the camera.
3. Event Hubs data moves to real-time Stream Processing, and also to Data Storage. Data Storage will both be on-premise and in the cloud. Video data is retained in Data Storage for as long as necessary to complete analysis.
4. Stream Processing data moves through Middleware for analysis and enters Presentation.
5. Presentation reads data from Big Data, which reads from Data Storage that may contain personal information. Big Data is governed by purpose of use. Surveillance video will not be combined with personal information from Data Storage.

Sound sensor audio, Non-personal-identifiable sensor data

1. Data that does not identify a person is collected by sensors.
2. Sensor data moves to Data Collection and then to Event Hubs Data Collection and Event Hub will both be on-premise and in the cloud. Access to Data Collection and Event Hub will be tightly controlled. Data are not persisted in Data Collection and Event Hub.
6. Event Hubs data moves to real-time Stream Processing, and also to Data Storage. Data Storage will both be on-premise and in the cloud. Data is retained in Data Storage for as long as necessary to complete analysis.
3.
4. Stream Processing data moves through Middleware for analysis and enters Presentation.
5. Presentation reads data from Big Data, which reads from Data Storage that may contain personal information. Big Data is governed by purpose of use. Sensor data will not be combined with personal information from Data Storage.

3 Sustainable Transportation (1.2)

3.1 Data flow diagram



3.2 Data flow and Data classification

Data Classification Matrix

The following table documents the data collected:

	Data	Data Classification	Purpose	Data Steward
1.	Sensor data	Sensor data	To detect if electric charging station is: - receiving power - operational	IT
2.	Credit card data	Financial data	To pay at the electric charging station for use of the station	IT

	Data	Data Classification	Purpose	Data Steward
3.	Non-personal-identifiable sensor data (motion, water level)	Sensor data	To detect congestion, traffic incidents for: - improving traffic planning, emergency response time - sharing congestion and route information with the public	IT

Link assets to hub

7. Sensor data is collected by charging station sensors to collect if electricity is being supplied to the station, and if the station is operational.
8. Sensor data moves to Data Collection and then to Event Hubs Data Collection and Event Hub will both be on-premise and in the cloud. Access to Data Collection and Event Hub will be tightly controlled. Data are not persisted in Data Collection and Event Hub.
9. Event Hubs data moves to real-time Stream Processing, and also to Data Storage. Data Storage will both be on-premise and in the cloud. Data is retained in Data Storage for as long as necessary to complete analysis.
10. Stream Processing data moves through Middleware for analysis and enters Presentation.
11. Presentation reads data from Big Data, which reads from Data Storage that may contain personal information. Big Data is governed by purpose of use.

Finding Charging Station with user mobile device

6. Charging station location is downloaded onto mobile device and plotted on to a map.
7. With the user's consent, the device's current geographical location is shared directly with the mapping service (ex. Google Map, Apple Map) to plot the device's location in relationship to the charging stations. The device's location is not shared with the City's systems.

Paying for use of Charging Station through the Charging Station itself

1. The user of the station share payment information such as credit card or debit card information with the station. The station communicates directly with the payment processor to receive the payment.
2. The payment processor sends authorization data to the charging station and to the City's control system to enable the station.
3. The payment processor sends transaction data to the City's finance system to be recorded. The transaction data includes date of transaction, station location, and payment amount.

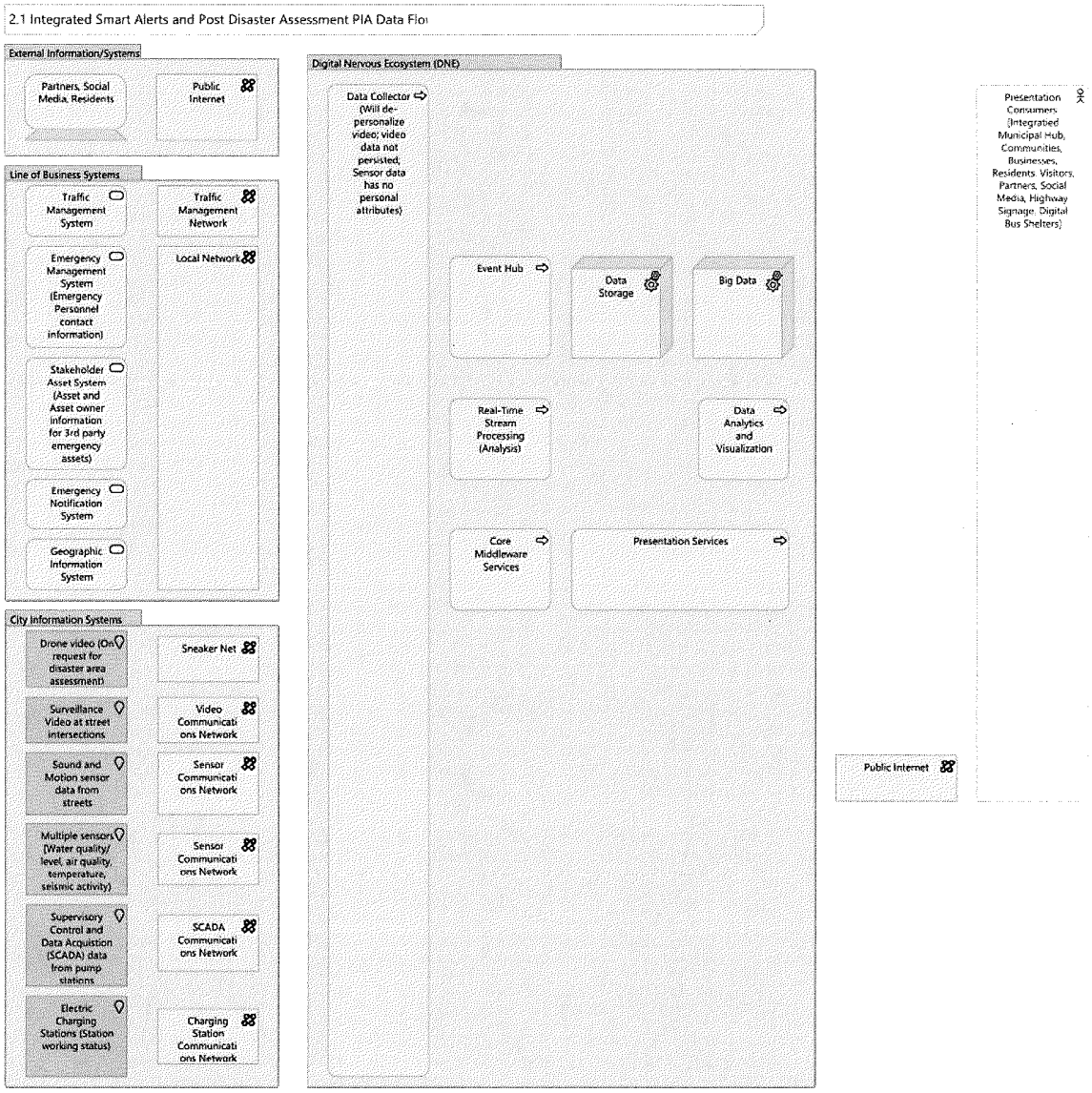
Payment for use of Charging Station with MyRichmond mobile app on the user mobile device

1. The user of the station share payment information such as credit card or debit card information with the mobile app.
2. The mobile app sends payment information to the payment processor and receives authorization data.

3. The mobile app sends charging station ID to the City's control system to enable the station.
4. The payment processor sends transaction data to the City's finance system to be recorded. The transaction data includes date of transaction, station location, and payment amount.

4 Integrated Smart Alerts and Post Disaster Assessment (2.1)

4.1 Data flow diagram



4.2 Data flow and Data classification

Data Classification Matrix

The following table documents the data collected:

	Data	Data Classification	Purpose	Data Steward
1.	Drone data	Sensor data, Camera data	To assess damage to buildings and dike	IT
2.	Non-personal-identifiable sensor data (motion, water level, water pressure, water flow, seismic, temperature, air quality)	Sensor data	To detect emergency incidents and assess damage of: - water systems - sustainable energy systems - city buildings - dike	IT
3.	Camera video	Sensor data	To detect damage and breach to pump stations and dike	IT
4.	Emergency contact information (person name, contact email, neighborhood area)	Personal data	To send emergency communication and Blockwatch newsletter to interested individuals	IT
5.	Senior government and stakeholder asset information	Sensor and Personal data	To create a centralized repository of assets, sensors and ownership to effectively coordinate maintenance and operability of assets	IT
6.	Electric charging station location and availability	Location and sensor data	1. Increase accessibility for residents and visitors to the electric vehicle charging stations with information on locations of in-service electric vehicle charging stations (outside of an emergency situation). 2. Support emergency responders and emergency repair teams with information on locations of in-service electric vehicle charging stations during and post an emergency situation. 3. Effectively maintain electric vehicle charging stations.	IT

<u>Detect incidents and assess damage with Drones</u>

12. Sensor and video data is collected by Drones dispatched to the dike and to City buildings.
13. Video data moves to Data Collection and then to Event Hubs Data Collection and Event Hub will both be on-premise and in the cloud. Access to Data Collection and Event Hub will be tightly controlled. Data are not persisted in Data Collection and Event Hub. Data Collection will de-personalize video data that has not yet been de-personalized by the drone camera.

14. Event Hubs data moves to real-time Stream Processing, and also to Data Storage. Data Storage will both be on-premise and in the cloud. Video data is retained in Data Storage for as long as necessary to complete analysis.
15. Stream Processing data moves through Middleware for analysis and enters Presentation.
16. Presentation reads data from Big Data, which reads from Data Storage that may contain personal information. Big Data is governed by purpose of use.

Detect incidents and assess damage with non-personal-identifiable sensors

1. Sensor data is collected by sensors on dikes, pump stations, and the ground.
2. Sensor data moves to Data Collection and then to Event Hubs Data Collection and Event Hub will both be on-premise and in the cloud. Access to Data Collection and Event Hub will be tightly controlled. Data are not persisted in Data Collection and Event Hub.
3. Event Hubs data moves to real-time Stream Processing, and also to Data Storage. Data Storage will both be on-premise and in the cloud. Data is retained in Data Storage for as long as necessary to complete analysis.
4. Stream Processing data moves through Middleware for analysis and enters Presentation.
5. Presentation reads data from Big Data, which reads from Data Storage that may contain personal information. Big Data is governed by purpose of use.

Detect incidents and assess damage with fixed cameras within pump stations and at dikes

1. Video data from the pump stations and dikes moves to Data Collection and then to Event Hubs Data Collection and Event Hub will both be on-premise and in the cloud. Access to Data Collection and Event Hub will be tightly controlled. Data are not persisted in Data Collection and Event Hub. Data Collection will de-personalize video data that has not yet been de-personalized by the drone camera.
2. Event Hubs data moves to real-time Stream Processing, and also to Data Storage. Data Storage will both be on-premise and in the cloud. Video data is retained in Data Storage for as long as necessary to complete analysis.
3. Stream Processing data moves through Middleware for analysis and enters Presentation.
4. Presentation reads data from Big Data, which reads from Data Storage that may contain personal information. Big Data is governed by purpose of use.

Collect emergency contact information and communicate with contacts

1. Personal data including name, contact email, and address is shared voluntarily by individuals to the City's systems for the purposes of receiving emergency notifications and Blockwatch newsletters. The City's Emergency Notification System has completed a Privacy Impact Assessment when the system was initially implemented.
2. Email communication is sent to contact email through distribution lists by City staff. City staff refers to the distribution list when communication but cannot see the content of the list itself.
3. Blockwatch email newsletter is sent to distribution lists, categorized by neighborhood, by City staff. City staff refers to the distribution list when communication, but cannot see the content of the distribution list itself.
4. Emergency contact information can be accessed by City staff for the purposes of administration of contact information (removal by request of customer, keeping information current, adding information based on request of customer)

Create a database of senior government and stakeholder assets

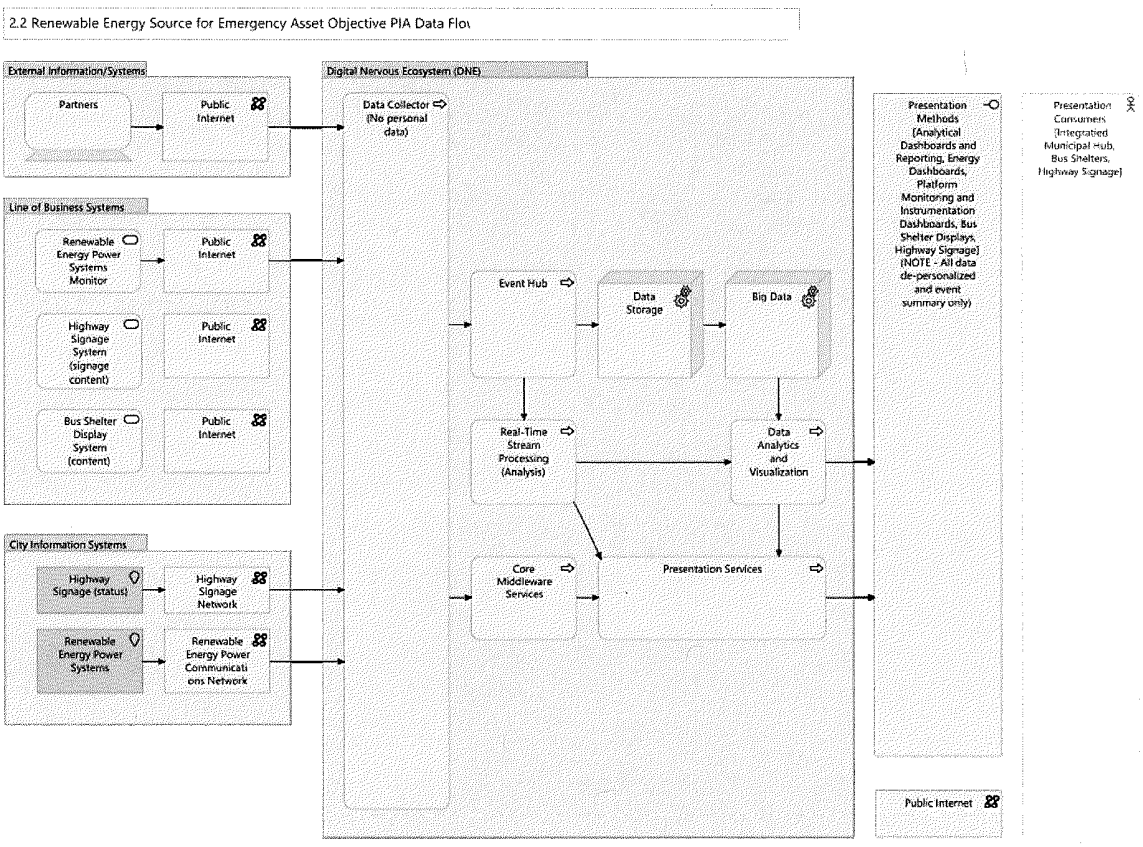
1. Sensor data from vehicle, buildings and other sensor mounted assets is collected and registered into City Information/Systems. Data would include Asset Owner data (Asset Owner Unique Identified, Name, Address, Contact Number, Email Address) and Asset Information. (Asset Unique Identifier, Parent Asset Unique Identifier, Serial Number, MAC/GUID).
2. Presentation reads and enables authorized staff to display and/or modify Asset Owner and Asset Information data from Big Data, which reads from Data Storage that may contain personal information. Big Data is governed by purpose of use.

Provide online locators for all electric charging stations

1. Location data of the electric charging stations and sensor data tracking the charging stations availability is collected
2. Location data and sensor data_moves to Data Collection and then to Event Hubs Data Collection and Event Hub will both be on-premise and in the cloud. Access to Data Collection and Event Hub will be tightly controlled. Data is not persisted in Data Collection and Event Hub.
3. Event Hubs data moves to real-time Stream Processing, and also to Data Storage. Data Storage will both be on-premise and in the cloud. Data is retained in Data Storage for as long as necessary to complete analysis.
4. Stream Processing data moves through Middleware for analysis and enters Presentation.
5. Presentation reads data from Big Data, which reads from Data Storage that may contain personal information. Big Data is governed by purpose of use.

5 Renewable Energy Source for Emergency Assets (2.2)

5.1 Data flow diagram



5.2 Data flow and Data classification

Data Classification Matrix

The following table documents the data collected:

	Data	Data Classification	Purpose	Data Steward
1.	Non-Personal-identifiable sensor data (Generator data via SCADA System)	Sensor Data	To track power availability and consumption.	Public Works
2	Energy Dashboard data	Analytical data and notifications based on Sensor data	Integrated energy dashboards for virtual use and for the Integrated Municipal Operations HUB.	Emergency Programs

	Data	Data Classification	Purpose	Data Steward
3	Bus Shelter Display and Highway Signage sensor data	Sensor Data	To monitor power loss and consumption	City and External Partners

Generator Sensor data, Non-Personal-identifiable

Data is collected by sensors located on generator. Data from sensors is collected by the City's SCADA system. The Data Collection receives the data from the SCADA system and forwards it to the Event Hubs. The Data from the Event Hubs is stored in the Data Storage and also sent to stream processing. Events detected by stream processing are sent to complex event processing which forwards notification data to Notifications to be displayed in real-time on the Dashboards. Stream processing also sends data to Data Analysis & Visualization for display on Dashboards and reports.

Energy Dashboard data

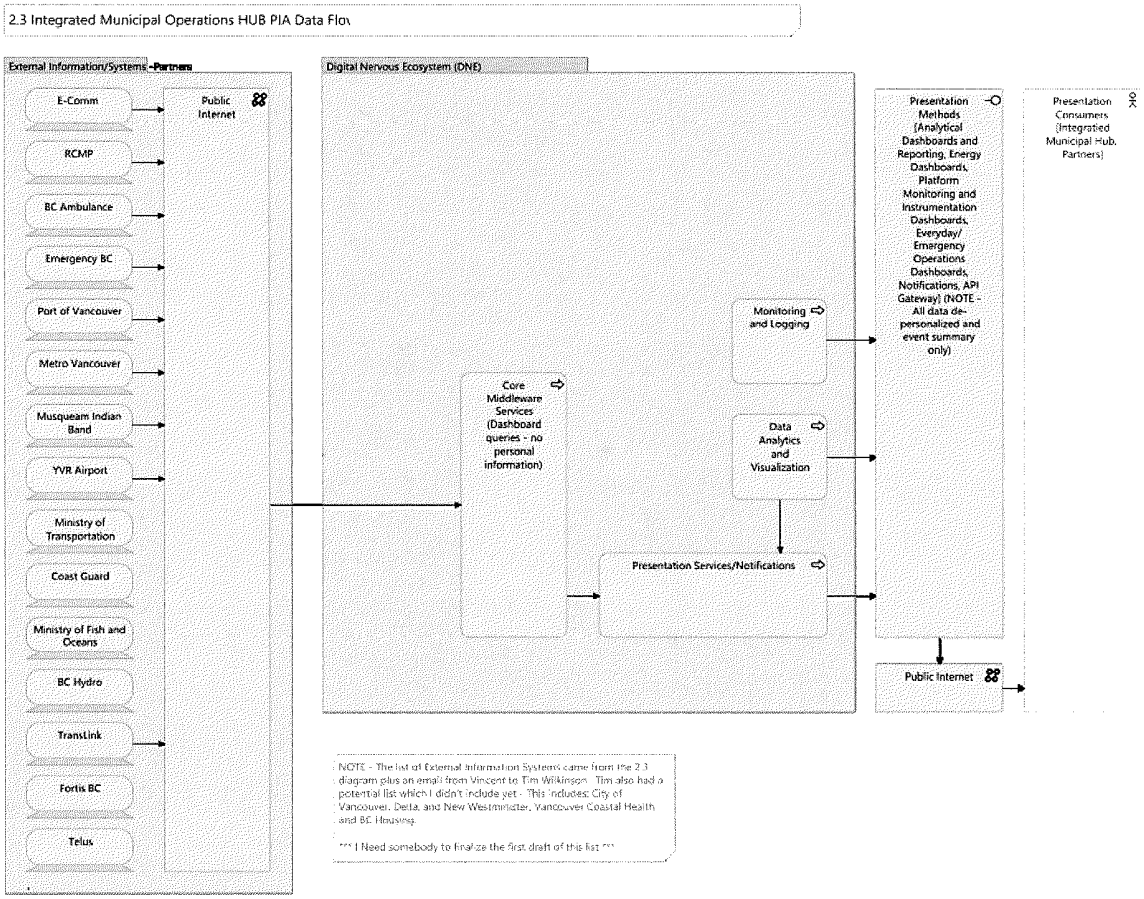
Data is received from the Data Analysis and Visualization component in the Middleware and also from the Notifications. The Data Analysis and Visualization component combines real-time data from stream processing and historical data from big data into Visualizations.

Bus Shelter Display and Highway Signage sensor data

The Data Collection receives the data from the bus shelter displays and highway signage sensors and forwards the data to the Event Hubs. The Data from the Event Hubs is stored in the Data Storage and also sent to stream processing. Events detected by stream processing are sent to complex event processing which forwards notification data to Notifications to be displayed in real-time on the Dashboards. Stream processing also sends data to Data Analysis & Visualization for display on Dashboards and reports.

6 Integrated Municipal Operations HUB: Physical & Virtual (2.3)

6.1 Data flow diagram



6.2 Data flow and Data classification

Data Classification Matrix

The following table documents the data collected:

	Data	Data Classification	Purpose	Data Steward
1.	Sensor data	Sensor data	To detect if electric charging station is: - receiving power - operational	IT
2.	Credit card data	Financial data	To pay at the electric charging station for use of the station	IT

	Data	Data Classification	Purpose	Data Steward
3.	Non-personal-identifiable sensor data (motion, water level, see 2.1 Smart Alerts and 2.2 Renewable Energy Source for detail)	Sensor data	To detect emergency incidents and assess damage of: - water systems - sustainable energy systems - city buildings - dike	IT

Monitoring & instrumentation Dashboards

17. Data Analysis, BI & Visualization (DBIV) receives data from Stream Processing and Big Data. See write-up for 2.1 and 2.2 for detail of that flow. Data do not include personal identifiers.
18. DBIV sends visualized data to Presentation dashboards. Dashboards may be embedded as HTML widgets on partner systems through secure HTTP traffic (HTTPS). Dashboard information include:
    a. Metrics from sensors at locations across the City: Water level/pressure/flow, road temperature, wind speed, sound level, etc.
    b. Indicators from sensors at locations across the City: Traffic congestion level (smooth/congested/unknown), Seismic activity (detected/not detected), Assets state (operational/broken/unknown), etc.
    c. Time information from sensors at locations across the City: Time of last seismic activity, Time of last incident
    d. Partner systems data: bus schedule, flight schedule, port arrivals, etc

Alerts through Monitoring & instrumentation

1. Data Analysis, BI & Visualization (DBIV) receives data from Stream Processing and Big Data. See write-up for 2.1 and 2.2 for detail of that flow. Data do not include personal identifiers.
2. DBIV sends data to Complex Event Processing to execute alert checks/rules
3. Complex Event Processing sends signals to Notifications to trigger alerts on Dashboards, devices registered with City staff, and Open API subscribers. Signal information does not include personal identifiers. Signal destinations include City staff information (mobile notification token) and Open API subscriber authorization keys.

Sharing through Open API (external Operations Hub and general public)

1. Partners may register with City systems to consume API services or subscribe to data changes as participants in the virtual Operations Hub. Participants in the virtual Operations Hub can consume API services and subscribe to data changes to receive Dashboard level information. No other information is shared beyond this.
2. Partners may register with City systems to consume API services or subscribe to data changes to provide value-added services such as Online Map services consuming City traffic congestion level data to overlay on top of maps. API services and data

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subscriptions used by these partners will not contain personal identifiers and personal data.

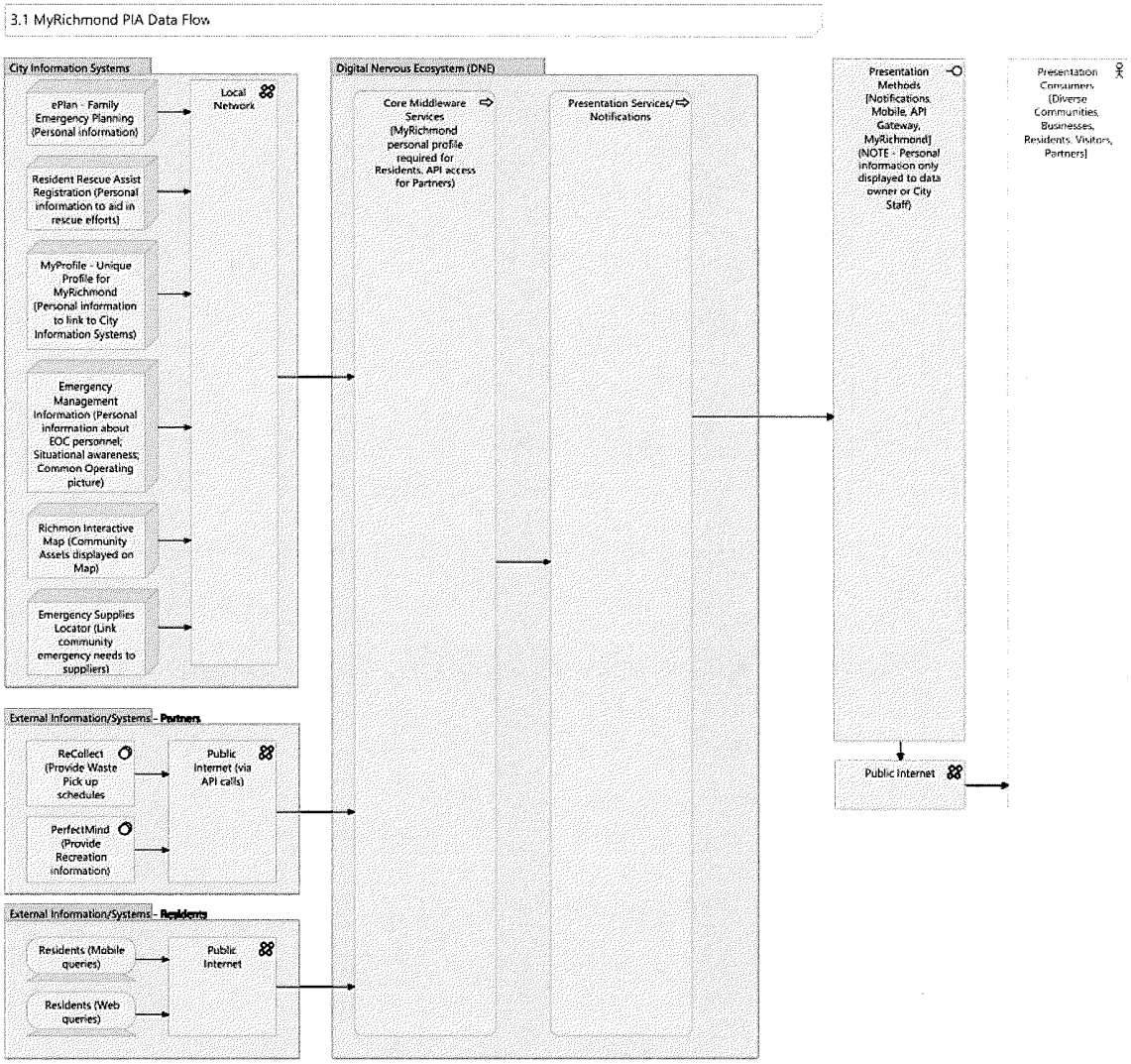
Based on objectives of other projects in the Smart Cities initiative, these are the data that would be shared through Open API:

- Traffic congestion state on City roads
- EV charging station locations on City roads and properties
- Special City event parking locations
- Low resolution intersection traffic camera images (currently shared through City website)
- Vehicle counts stopped at intersections
- Road temperature around the city (currently shared through City website)
- Water level around the city (currently shared through City website)
- E-bike docking station locations around the city
- Potentially seismic sensor readings from EMBC
- Potentially rapid damage assessment from EMBC and SD38
- Potentially bus schedules/arrival times from Translink
- Potentially plane arrival/departure times from YVR
- Potentially incident information around the city from E-comm
- Road closures information around the city from a combination of city data and E-comm data
- Alert messages from Emergency Programs and Corporate Communications
- Evacuation routes around the city
- Evacuation location around the city
- Childcare locations around the city (currently shared through City website)
- Community centres, arenas, pool locations around the city (currently shared through City app)
- Public wifi locations around the city (currently shared through City website)

Data sharing between external partners (not including the public) will be scoped in detail prior to implementation.

7 MyRichmond (3.1)

7.1 Data flow diagram



7.2 Data flow and Data classification

Data Classification Matrix

The following table documents the data collected:

	Data	Data Classification	Purpose	Data Steward

	Data	Data Classification	Purpose	Data Steward
1.	ePlan	Personal Data - Family Emergency planning database	Family Emergency planning system Meeting place for family members Insurance information	ESS - Emergency Programs
~~2~~	WiFi	Location and Device MAC Address data	User acceptance page on WiFi portal to gain access to WiFi.	~~IT~~
3	Resident Rescue Assist Registration	Personal data	To provide information about residents to aid in rescue efforts on emergency situations.	Emergency Programs
4	MyProfile	Identity		IT
5	EMIS – Emergency management information system	Location data, incident information and refuge locations	Crisis management system. Web based software which everybody who would play a part in the EOC can make use of for a common operating picture, situational awareness, process execution, ensuring the right steps are completed, and lastly a data point input and output for partners.	Emergency Programs
6	Richmond Interactive Map (RIM)	Location data and Asset details	Display Community assets on Maps. For example childcare centres	Community Social Services
7	Emergency Supplies Locator -Digital connection between local business/suppliers and residents in an emergency	Information regarding supplies/services and the suppliers with location information.	Support community during emergence response e.g bottle water and other emergency supplies	Emergency Programs

ePlan

Family Emergency planning database contains emergency contact, family members and insurance information. MyRichmond retrieves the following information family member MyProfile identities, mobile device contact information and meeting place.

Information from ePlan is accessed by the Core Middleware Services based on the MyProfile identity. From the core middleware the information flows to both presentation services for access via web browser and to notifications via the complex event processing. Notifications are sent to both Mobile and web browsers via the Presentation layer.

WiFi

User's personal information is not collected. Authenticate is cached for 24 hours by MAC Address. Location can be tracked via MAC address.

Resident Rescue Assist Registration

The following personal data is shared by residents for the purpose of aiding rescue and assistance in an emergency.

- **Name**: for identification and communication when making contact
- **Address**: required to know where to find the resident
- **Phone** (mobile/landline): to be able to contact the resident
- **Mobility restriction**: indicates would require assistance in an evacuation; can be a checkbox with optional text field to elaborate (in brief) on the nature of mobility impediments.
- **Medical conditions**: only those related to evacuation or rescue; should be checkbox with required text for elaboration since there are many different types of conditions and each may require different specialized response.
- **Tracking program**: this is a special category. There are a number of tracking programs for individuals with dementia and other conditions that often cause them to become disoriented and lost. Programs like Project Lifesaver. Family members can use this to pre-register with first-responders and include the necessary information for them to use these programs to help locate and rescue the lost family members. List of programs registered in is provided to MyRichmond.

The above information is stored in the Rescue Assist Registration database. This information is accessed by the Core Middleware Services. The Core Middleware Services combines the information with the resident's MyProfile identity. The combine information is accessed by the Presentation layer via the Presentation services. The Presentation layer displayed the information on the MyRichmond User Interface.

MyProfile

First name, last name, date of birth, phone number, email address, mailing address and opt-in, recreation online (Class) Client Id and pin, PerfectMind contact Id is stored in MyProfile used to link to recreation system.

The MyProfile information is collected from the Residents via the Presentation and sent to the Security/Privacy/Identity component. The MyProfile information is used when Residents login to MyRichmond. The MyProfile identity is propagated by the Presentation to presentation services. The Presentation services use the MyProfile identity to obtain personal information from backend LOBs via the Core Middleware Services.

EMIS – Emergency management information system

Crisis management system information is collected from various systems. The system contains information regarding location of emergency, incident and refuge locations. This information is access via Core Middleware Services, combined with the resident's MyProfile identity,

processed via complex event processing and sent to notifications. Notifications are consumed by MyRichmond Web and mobile devices.

Richmond Interactive Map (RIM)

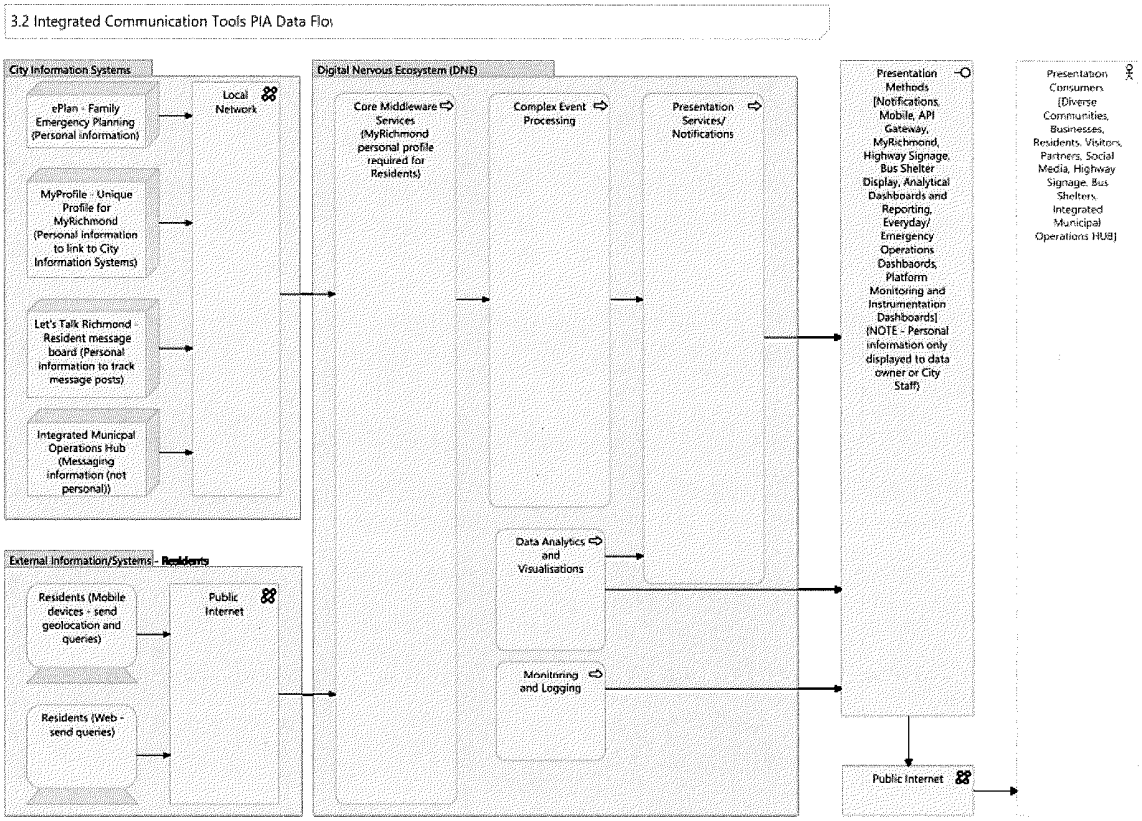
The Presentation layer calls Presentation Services with the MyProfile identity. Presentation Services invokes Core Middleware Services. Core Middleware Services using MyProfile identity to determine location, requests map information from RIM based on the location. The Map together with the Asset details are displayed by the Presentation Layer. An example of the type of information presented to the Resident is child care centres locations and details.

Emergency Supplies Locator - Digital connection between local business/suppliers and Residents in an emergency

The Presentation layer calls Presentation Services with the MyProfile identity. Presentation Services invokes Core Middleware Services. Core Middleware Services using MyProfile identity to determine location. Based on location business/suppliers details are retrieve from the LOB application via Core Middleware Services. This information can be also utilized with RIM and Presented to the resident.

8 Integrated Communication Tools (3.2)

8.1 Data flow diagram



8.2 Data flow and Data classification

Data Classification Matrix

The following table documents the data collected:

	Data	Data Classification	Purpose	Data Steward
1.	ePlan	Family Emergency planning database	Family Emergency planning system Meeting place for family members Insurance information	ESS - Emergency Programs
2	MyRichmond BC	Location data	Sending emergency broadcasts to people within a specific geographical area at risk.	IT
3	MyProfile	Identity		IT

	Data	Data Classification	Purpose	Data Steward
4	Let's talk Richmond	Identity	Ongoing public interaction on emergency preparedness.	Corporate Communications
5	Integrated Municipal Operations Hub	Messages	Broadcasts messages through multiple channels including City operated web sites, portals and mobile applications in the event of an emergency.	

ePlan

Family Emergency planning database emergency contact, family members and insurance information. MyRichmond contains the following information family member MyProfile identities, mobile device contact information and meeting place.

Information from ePlan is accessed by the Core Middleware Services based on the MyProfile identity. From the core middleware the information flows to both presentation services for access via web browser and to Notifications via the complex Event Processing. Notifications are sent to both Mobile and web browsers via the Presentation layer.

MyProfile for Richmond BC Mobile App

First name, last name, date of birth, phone number, email address, mailing address and opt-in, recreation online (Class) Client Id and pin, PerfectMind contact Id is stored in MyProfile used to link to recreation system.

The MyProfile information is collected from the Residents via the Presentation and sent to the Security/Privacy/Identity component. The MyProfile information is used when Residents login to MyRichmond. The MyProfile identity is propagated by the Presentation to presentation services. The Presentation services use the MyProfile identity to obtain personal information from backend LOBs via the Core Middleware Services.

MyRichmond

Location data may be used to geofence emergency broadcasts, so that messages may be delivered to the people who are in the immediate area.

The location data flows from the Mobile to Core Middleware Services to Emergency Notification System, which stores it in a short term storage database. When emergency broadcasts are initiated, Complex Event Processing will combine the location data with the geofence definition (if specified) for targeted delivery via Notifications.

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Let's Talk Richmond

First and last name, e-mail, postal code. Messages posted are stored in the database.

The above information is stored in the Let's talk Richmond database. This information is accessed by Core Middleware Services. The Middleware Services combines the information with residents MyProfile identity. The combined information is accessed by the Presentation layer via the Presentation services. The Presentation layer displays information on the MyRichmond user interface. The information also flows to notifications via the Complex Event Processing.

For message translation, individual messages flow from Let's Talk Richmond database through Core Middleware Services to Communication for real time translation.

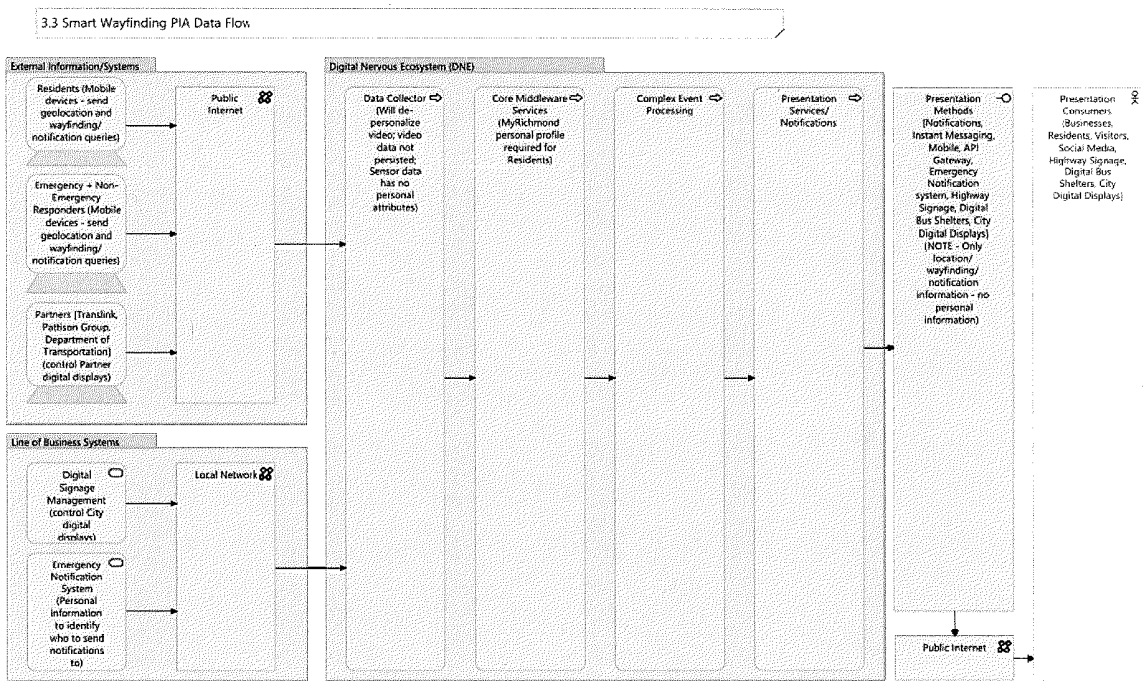
Integrated Municipal Operations Hub

The Integrated Municipal Operations Hub allows messages to be entered once and then delivered to city own/operated systems and via partners in the event of an emergency.

Private information is not passed between systems. The message flows through the Middleware Services to Complex Event Processing, then to notifications for for delivery to each target system. Each message will have parameters attached that influence how the message should be delivered (priority, geofence, etc.)

9 Smart Way-Finding Solution (3.3)

9.1 Data flow diagram



9.2 Data flow and Data classification

Data Classification Matrix

The following table documents the data collected:

	Data	Data Classification	Purpose	Data Steward
1.	Display Boards	Sensor data	To improve communication with the community and partners to provide accessibility to critical information during an emergency	IT

	Data	Data Classification	Purpose	Data Steward
2.	Mobile devices	Personal data	To obtain access to mobile devices within a pre-defined geo-location to: - disseminate location-specific emergency notifications to all mobile carrier connected devices owned by residents, visitors, and businesses. - minimize confusion within the community by targeting information to specific areas impacted by an emergency - improve community safety by guiding public movement in a safe and effective manner during emergencies or major events using consistent and coordinated messaging	IT
3.	Way finding	Sensor & Personal data	Enhance the understanding and experiences of residents, workers and visitors as they navigate through Richmond To integrate wayfinding and digital assets with online information technologies	IT
4.	Digital Assets	Asset data	To centralize access and process to various digital assets that will be referenced by Richmond's Emergency Information Plan	IT

1.0 Display Boards

19. Digital Signage Management solution would manage the content and security for access and authorisation.
20. External Information Sources would manage the content and security for access and authorization.
21. Display board data source content moves to Data Collection and then to Event Hubs Data Collection and Event Hub will both be on-premise and in the cloud. Access to Data Collection and Event Hub will be tightly controlled. Data are not persisted in Data Collection and Event Hub.
22. Data Collection and Event Hub data moves to Data Storage. Data Storage will both be on-premise and in the cloud. Data Storage is governed by purpose of use.
23. Event Hub data is transferred to Stream Processing before transferring to Complex Event Processing, which routes the data to Notifications.
24. Notifications will pass the relevant data to Middleware for analysis and into the Presentation module.
25. Presentation calls upon the appropriate Presentation Services.
26. Presentation Services routes the various data to the Presentation layer for Richmond managed display boards.
27. Presentation Services routes the various data to the Presentation layer for dissemination to External Information sources, where appropriate.

2.0 Mobile devices

8. Device owners would be given the opportunity to signup for Mobile notifications using the City's Emergency Notification system. The Emergency Notification system would manage the content and security for access and authorisation.
9. Device owners would be given the opportunity to signup for Mobile notifications. External Information Sources would manage the content and security for access and authorization. Device owner information is the Intellectual Property of Richmond and will not be shared with External Information Sources.
10. Device Information is transferred to Data Collection and Event Hub. Data Collection and Event Hub will both be on-premise and in the cloud.
11. Data Collection and Event Hub data moves to Stream Processing, which moves the data to Complex Event Processing.
12. Complex Event Processing reviews the data and transfers it to Notifications and into Core Middleware Services.
13. Core Middleware Services will pass information to:
    a. Presentation Services for distribution to Mobile and myRichmond.
    b. Complex Event Processing which relays the data to Notifications for distribution to External Information Systems.

3.0 Way finding

1. Sensor data is collected by wayfinding stations to identify a device.
2. Sensor data moves to Data Collection and then to Event Hubs. Data Collection and Event Hub will both be on-premise and in the cloud. Access to Data Collection and Event Hub will be tightly controlled. Data are not persisted in Data Collection and Event Hub.
3. Event Hubs data moves to real-time Stream Processing, and also to Data Storage. Data Storage will both be on-premise and in the cloud. Sensor data is retained in Data Storage for as long as necessary to complete analysis.
4. Stream Processing data moves to Complex Event Processing, which routes the data to Notifications.
5. Complex Event Processing will pass the relevant data to Middleware for analysis and into the Presentation module.
6. Presentation Services publishes content to Display Boards, Wayfinding kiosks, myRichmond, Mobile and API Gateway (Open Data) in the Presentation layer.
7. API Gateway (OpenData) will present data for consumption by Social Media, Digital Bus Shelters, Highway Signage and the Integration Municipal Operations HUB.

4.0 Digital Assets

1. Building and Vehicle asset data is collected into the City's Fleet Management System and Asset & Work Management System.
2. Asset data
    a. Creation activity transfers data to Data Collection. Data Collection is both on-premise and in the cloud. Access to Data Collection will be tightly controlled. Data are not persisted in Data Collection.
    b. Updating activity transfers data to Core Middleware Services for processing.

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3. Data Collection transfers data to Core Middleware Services.
4. Core Middleware Services transfers the data to Fleet Management System and Asset & Work Management System.

SECTIONS FROM PART 3 (PROTECTION OF PRIVACY) OF THE *FREEDOM OF INFORMATION PROTECTION OF PRIVACY ACT* (FIPPA)

SECTION	DETAILS
Section 26	*Purpose for which personal information may be collected.* Section 26 states that personal information may be collected only if such collection is authorized by or under legislation, essential for operating programs or activities, or collected for law enforcement purposes.
Section 27	*How personal information is to be collected* Under this section public bodies must, with limited exceptions, collect personal information directly from the person for whom it pertains. Public bodies must also notify individuals of the purpose for which they are collecting information, the legal authority for the collection and the title, business address and business telephone number of a public body employee who can answer questions about the collection.
Section 28	*Accuracy of personal information* This section places the onus upon the public body to ensure that the information it relies on, or that is relied upon on the behalf of the public body, to make a decision about an individual, is accurate and complete.
Section 29	*Right to request correction of personal information.* Section 29 gives applicants the right to ask a public body to correct their personal information where it is wrong. This section also requires public bodies to make additions to that information if it is demonstrated to be incomplete or missing. Further, all persons or organizations that have received copies of the information within the previous year are informed of the correction or annotation so that they can update their own records.
Section 30	*Protection of personal information* Section 30 requires a public body to provide appropriate physical and procedural security measures to protect personal information in its custody or under its control. This section also requires the public body to ensure that access by staff is governed on a need-to-know basis.
Section 31	*Retention of personal information* Section 31 requires public bodies to keep personal information for a minimum of one year wherever public bodies have used that information to make a decision on an individual in a way that has an impact on an individual's life. This is to allow the individual a reasonable opportunity to access this information through a formal *Freedom of Information* request.
Section 32	*Use of personal information* Section 32 must be read in concert with section 26, which establishes the purposes for which information can be collected by a public body. Section 32 requires public bodies to use personal information only for the purposes for which it was originally collected, unless: (a) the information is to be used by the public body for the purpose which is reasonably and directly related to the original purpose for collection (b) the person the information is about identifies the information and agrees to another use; (c) the information is to be used for reasons for which information was disclosed

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	to the public body under sections 33 to 36.
Section 33	*Disclosure of personal information* Section 33 states that a public body must only disclose personal information in accordance with sections 33.1 (disclosure inside or outside of Canada) and 33.2 (disclosure inside Canada). Both sections permit, but does not require, disclosure at the discretion of the public body. For a list of limited disclosure circumstances, please refer to the *Act*. http://www.bclaws.ca/Recon/document/ID/freeside/96165_00
Section 34	*Definition of consistent purpose* Section 34 states the criteria by which a use of personal information is deemed to be consistent with the use for which it was obtained or compiled under s. 32 and s. 33.2. A use of personal information is consistent with the purpose for which it was obtained or compiled if: • It has a reasonable and direct connection to the original purpose; and, • Is necessary to perform the statutory duties of or to operate a legally authorized program of the public body that uses or discloses the information or causes the information to be used or disclosed.
Section 35	*Disclosure for research or statistical purposes* Section 35 permits disclosure of personal information for purposes related to research and statistical studies provided all four conditions listed under the section are met. To see the four conditions please refer to the Act. http://www.bclaws.ca/Recon/document/ID/freeside/96165_00
Section 36	*Disclosure of archival or historical purposes* Section 36 states the circumstances under which the archives of a public body may disclose personal information or cause personal information in its custody or under its control to be disclosed. Section 36 contains four circumstances under which an archives may legally disclose personal information at its discretion. For more information please refer to the Act. http://www.bclaws.ca/Recon/document/ID/freeside/96165_00

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PERSONAL INFORMATION PROTECITON AND ELECTRONIC DOCUMENTS ACT (PIPEDA)

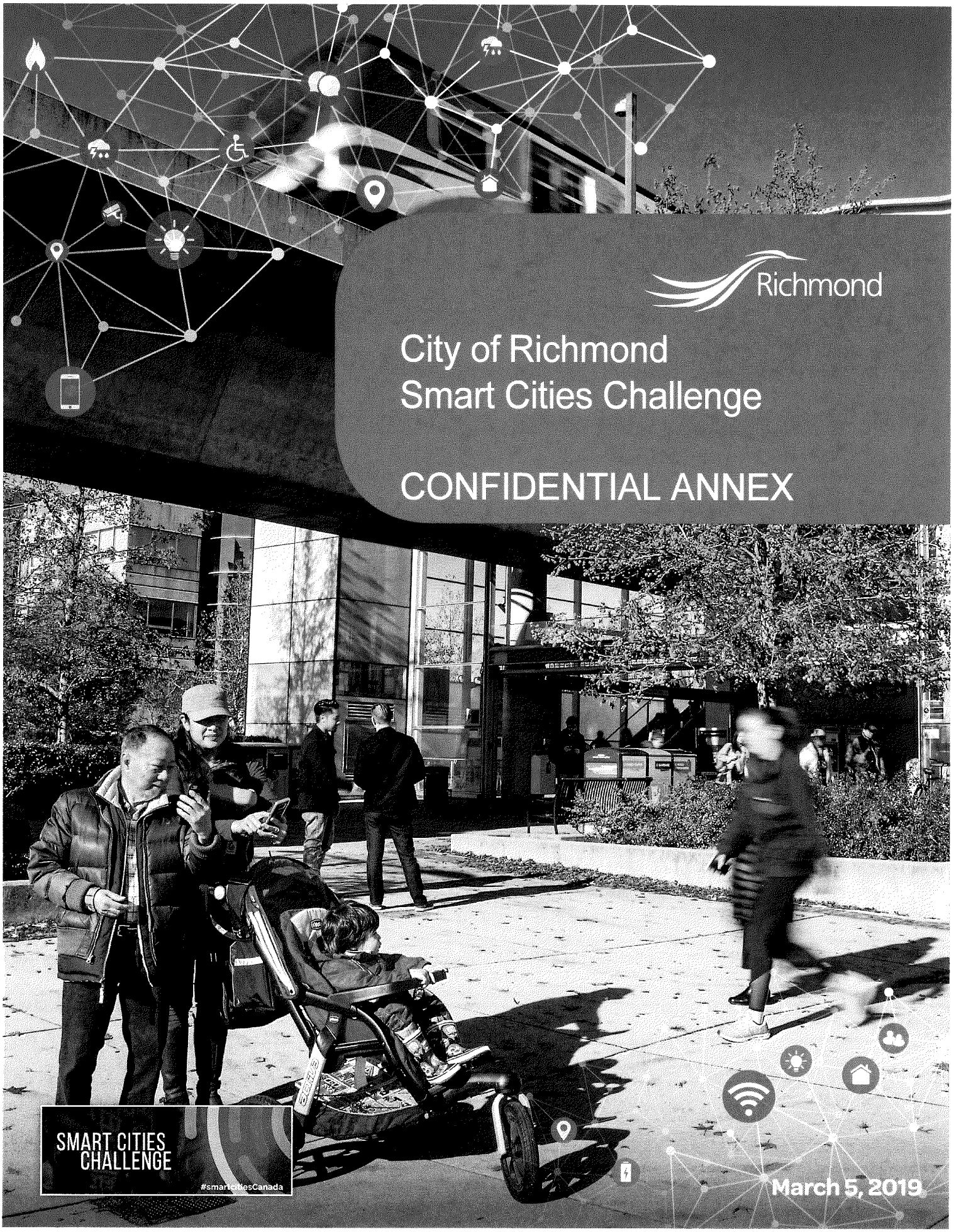
We are committed to protecting personal information and the privacy of our citizens and are operating in alignment with the PIPEDA fair information Principals. We understand that by being covered we must obtain an individual's consent when we collect, use or disclose the individuals personal information; ensure the individual has a right to access personal information held by us and to challenge its accuracy; ensure personal information can only be used for the purposes for which it is collected; and ensure personal information is protected by appropriate safeguards. Below we detail how we comply with each of the PIPEDA fair information Principals.

Principle 1 Accountability	We have appointed a privacy officer to be responsible for our data and privacy compliance and have developed and implemented personal information policies and practices for protecting personal information held by us. This has involved creating a process for obtaining consent; putting policies in place to limit the collection use and discourse of personal information; implementing adequate security measures to protect virtual and physical data; developing a retention and destruction timetable; developing and implementing policies and procedures to respond to access requests; developing and implementing breach and incident management protocols; and delivering privacy training to employees.
Principle 2 Identifying Purposes	We have ensured that we have a clear purpose for collecting personal information and have identified why it is needed and how it will be used. We have recorded all identified purposes and as well as all obtained consents.
Principle 3 Consent	We have engaged out citizens from the start of our Smart Cities projects and have ensured that we have clearly communicated what data we are collecting, why we are collecting it and how we are protecting the privacy of the individual. The City does not gather any personal information without explicit and knowledgeable consent from the individual.
Principle 4 Limit Collection	We are committed to only collecting personal information that is necessary for our identified purposes and we are and will continue to be transparent about the kind of personal information we are collecting and what it will be used for. We have trained our staff to ensure that they are able to explain why the information is needed if asked.
Principle 5 Limit Use, Disclosure and Retention	We only use or disclose personal information for the purpose for which it is collected and only retain information for as long as necessary to satisfy the purposes. We have procedures in place for retaining and destroying personal information.
Principle 6 Be Accurate	We aim to keep personal information as accurate, complete and up to date as necessary taking into account its use and the interests of the individual. This is especially relevant for the emergency notification aspect of our Smart Cities Initiative.
Principle 7 Use Appropriate Safeguards	We have the appropriate safeguards in place to protect personal information against loss, theft, unauthorized access, disclosure, copying, use or modification. Any personal information is stored at our on premise data-centre protected by our secured network infrastructure, operational procedures and policy. Such security measures includes, but are not limited to: · Data transit between servers and clients are encrypted over the internet · The City uses a firewall to protect all internal data from the internet · Access to the data-center is granted to limited I.T. staff and is audited · Assess to the server is granted to limited I.T. staff and is audited

March 4, 2019

Principle 8 **Be open**	We aim to be completely transparent about our policies and practices for the management of personal information and have ensured that our staff are trained in the procedures for responding to individual enquiries. We are committed to ensuring that we clearly communicate how an individual can gain access to their personal information, how they can complain and what personal information is made available to other organizations and why.
Principle 9 **Give individuals access**	In accordance with the Freedom of Information (FOI) Act, any person (or organization/entity) may request access to records held by the City of Richmond and within the City's custody and/or control. We encourage our citizens and anyone else to contact the appropriate Department to ask whether the record they are seeking is available through a routine request. We have clearly communicated the process for accessing information on our website.
Principle 10 **Provide recourse**	We have a simple and easily accessible complaint procedure in place. We investigate all complaints receives and take appropriate measures to correct information handling and policies.

March 4, 2019



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References

Chapter 7

- 7.1 – MyRichmond Privacy Impact Assessment (PIA)

Chapter 8

- 8.1 – Estimated Funding Allocated for the Innovation Superclusters Initiative
- 8.2 – Completed Project Implementation Plan – 1.2 Sustainable Transportation

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Rouleur

Privacy Risk Assessment

Organization: City of Richmond
Initiative or Process in Scope: MyRichmond Customer Profile Project
Submission Date: March 19, 2018
Author: Jay Loder, Rouleur Consulting
Project Contact: Patrick Fong
Project Stage: Pre-implementation

Executive Summary

Rouleur Consulting Ltd. has been engaged by the City of Richmond (the City) to perform a number of Privacy Risk Assessments, also known as a Privacy Impact Assessments (PIA). The purpose of the Privacy Risk Assessment is to review compliance with the City's privacy obligations as established under their policies, the privacy requirements under the *Freedom of Information and Protection of Privacy Act (FIPPA)* and determine identifiable risks.

Richmond City Services Web Portal (MyRichmond) is a project that, along with related projects, are part of their Digital Strategy Integration Project which collectively aim to make the customer data throughout the City's systems more accessible to the customer and to enable a better experience with the City[1]. MyRichmond will be the single place for customers to access information about the relationship they have with the City of Richmond. MyRichmond will collect information that relates to a customer from across the various of the line of business systems at the City, users will no longer need to login to multiple systems to access their information.

This Review has determined that the City has the necessary authority to collect, use and disclose personal information for the program's purposes. This Review also determines that the program will include appropriate measures to protect personal information from such risks as unauthorized access, collection, use, disclosure or disposal, and only the necessary personal information will be collected.

This Privacy Risk Assessment is not intended as a certification tool guaranteeing compliance with the City's statutory obligations under *FIPPA*, rather, it serves to identify possible areas of non-compliance that require attention by the organization, and adoption of accepted best practices.

Some of the recommendations have implications beyond privacy which is consistent with the nature of privacy protection as it is often interwoven with information security, records management, and other business processes.

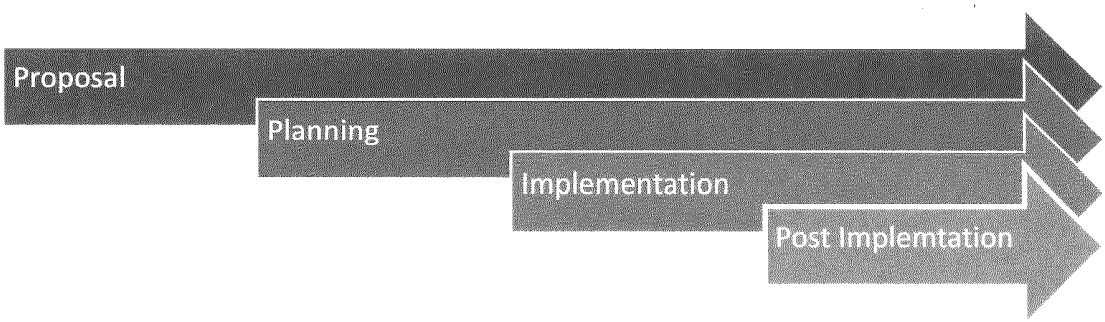
Overview of the Privacy Risk Assessment Process

[1] For this Assessment the City refers to the groups engaging with the City as 'customers'.

The Privacy Risk Assessment is a process that provides a review and evaluation of the risks and controls associated with privacy requirements. The Assessment can help organizations identify the most effective way to comply with their data protection obligations, meet privacy expectations and identify and rate privacy risks.

This report provides documentation of the risk assessment conducted regarding the applications and services in consideration. It also provides the project team and stakeholders with better understanding as to how the data collection, storage and handling requirements of their services relate to privacy requirements.

A Privacy Risk Assessment should be completed at the design stage of a new system or program, and



then revisited as program requirements and legal obligations change. Standard steps in the Assessment involve reviewing the proposal, the planning of the initiative, and the implementation. In many cases a post implementation review is conducted to ensure the initiative becomes operationalized as described.

Background

The City of Richmond is a local government that was incorporated as a municipality on November 10, 1879 and later designated as a City on December 3, 1990. With a population of over 218,000 people, the City is a mix of residential, and commercial property, agricultural lands, industrial parks, waterways and natural areas.

Responsibility for privacy at the City rests with the Legal and Legislative Services Division, the City is subject to the provisions of the *Freedom of Information and Protection of Privacy Act (FIPPA).*

Objective

Rouleur Consulting Ltd. has been engaged by the City to perform a Privacy Risk Assessment. The purpose of the Privacy Risk Assessment is to review compliance with the privacy requirements under *FIPPA*. In addition, we reviewed policies and procedures at the City that were relevant from the perspective of compliance with *FIPPA*. Recognized privacy protection best practices were also considered.

Introduction

This report presents findings and recommendations arising from our Review at the City of Richmond. The Review was conducted through March 2018. A draft report was delivered in March 19, 2018 and

was reviewed by the Project Team and select senior staff. This final report was submitted March 29, 2018.

Scope

The focus of the Review was limited to the My Richmond Personalization project.[2] Further related Privacy Risk Assessments regarding related services ("Single Sign On SSO" and "PerfectMind" applications) are underway. The adequacy and architecture of the data security controls relating to this project are not within the scope of this Assessment as it has been addressed by the project vendor Radical I/O.

Related Privacy Impact Assessments

There are no related PIA's or Privacy Risk Assessments completed the City. As mentioned, related programs are having Risk Assessments completed by the City.

Documentation Review

We reviewed several documents of relevance, chief among them the City's Information Technology Security Policy, Privacy Policy and the *FIPPA* legislation. As well, *"Accountable Privacy Management in BC's Private Sector"* published by the Office of the Information and Privacy Commissioner of BC (which sets out that Office's privacy management guidance and expectations for Public Bodies in British Columbia) was considered. A full listing of documents reviewed may be found in the Appendix to this report.

Overview of In-scope Services

The City of Richmond requires that its Digital Strategy is applied as a web-based set of services that work as one application and treat the person using this system as one customer. MyRichmond is intended to be the centerpiece of the City of Richmond's digital services. Working together with the existing Richmond.ca web site, the core of MyRichmond is a web application that accesses various data from various lines of business systems via web services. The City plans a Richmond Mobile app to take advantage of this in the future, so that common services are provided through both web and mobile channels. It is also possible for other City of Richmond applications to leverage these services as well.

Current Website, Mobile, and Customer Websites

Richmond.ca Website

The current Richmond.ca website is a content publishing platform, containing a large amount of static data. This system is the front line for users who want information from the City of Richmond.

Mobile Applications

Richmond has published a Richmond Mobile Application for iOS and Android. Being the primary mobile application for the city, these applications allow some access to collected events and collection schedules. Additionally, the City of Richmond has vendor provided mobile apps for service requests (Richmond Works), and collection schedule notifications (Recollect). The City of Richmond would like to combine these capabilities into the primary app at some point.

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Current Customer Web Applications

Customer Feedback System

Customer Feedback is used to send feedback to the City. The Customer Feedback app is a web-based application that co-exists with the Richmond.ca website and facilitates incoming/outgoing communication with customers:

Calendar of Events

The calendar of events is used to promote public and private events within Richmond.

Events Application

The Events app is used by customers for required permits and approval for an event held in the City.

City Grant

The City Grant application is used by the members of an organization to request a grant from funds set aside by the city for this purpose.

Tempest

Tempest is used to manage property tax and utilities billing.

Home Owner Grant

Related to property tax, the Home Owner Grant is awarded by the Province and applied to the property tax bill at the City of Richmond.

Class

Class is the system that houses recreation activities and programs. Class is slated to be replaced by PerfectMind in 2018. MyRichmond is intended to integrate with PerfectMind.

Current Foundation Services

MyRichmond Profile - Identity Systems

ForgeRock Identity Management is in use to facilitate identity and access control. Richmond has branded this service as "Richmond MyProfile". The MyRichmond Profile will allow users to manage their contact details and login account used for all the systems that take part at the City of Richmond. The customer can manage their profile, change notification settings, and add existing accounts from connected systems.

Staff Profile

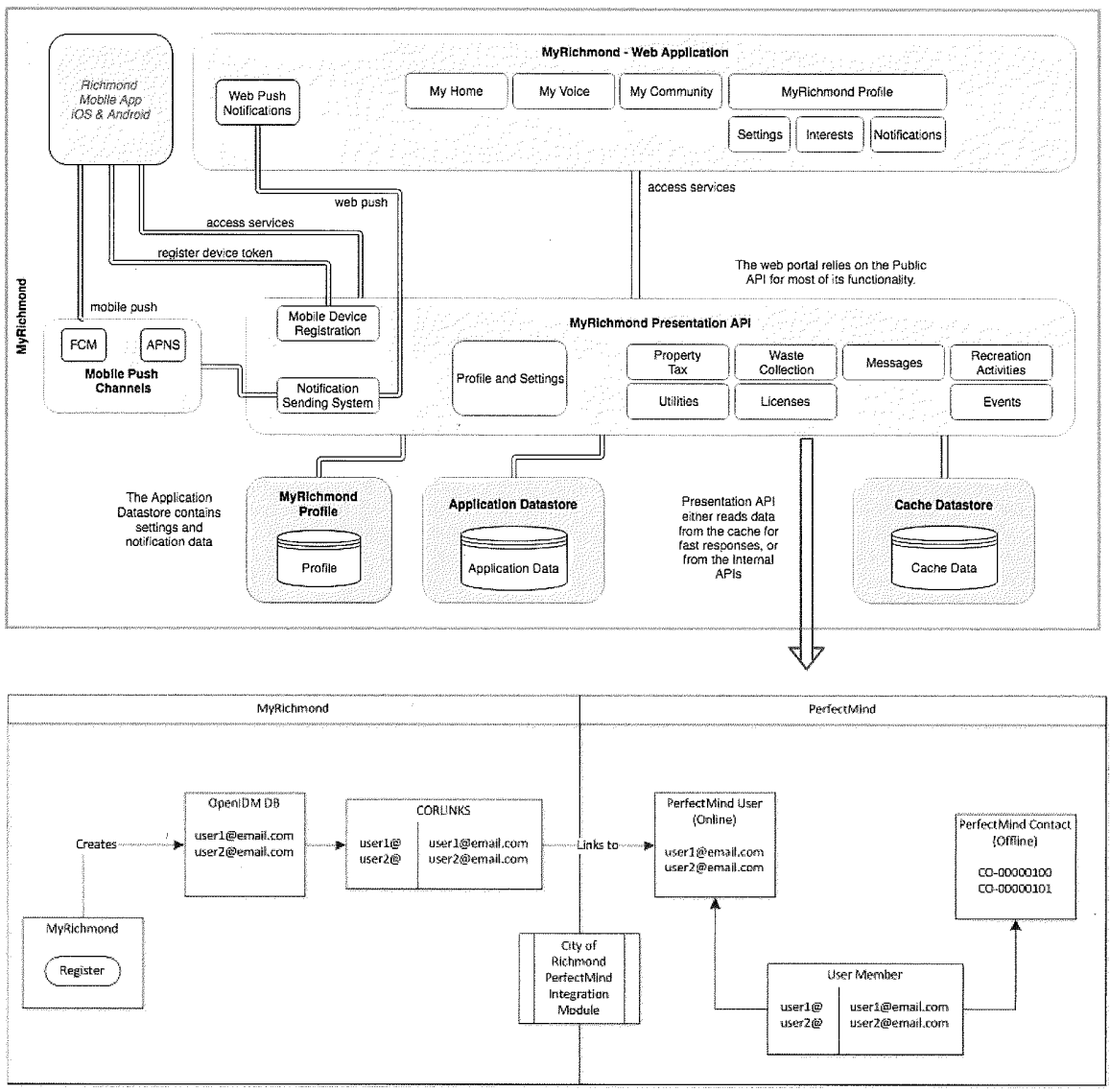
A Staff Directory is used to control staff access to systems. Active Directory is in use at the City.

Central Logging Services

The City maintains capabilities to collect and search logs across systems, to aid in problem determination and resolution.

Data Flow[3]

[3] Please see the Appendix for more detailed data flow diagrams



FIPPA Compliance

The following describes the legal authority for the City to collect, use and disclose personal information for the purposes of the program.

Collection, use and disclosure authority

This program qualifies as a program and an activity of the City. Therefore, the personal information described above is collected, used and disclosed for the purposes of a program and activity of the City. Further, the personal information data elements are collected for that purpose and have been identified as the personal information necessary to enable the program to function in accordance with its intended purpose. The City indicates that there is no new collection of personal information data elements through this program. Accordingly, collection of the personal information is authorized by s. 26(c) of *FIPPA*.

Storage in Canada

Personal information will be collected through an on-line application process, using forms made available through The City 's electronic services system. The personal information will be stored on The City 's servers located in Richmond (with backups on servers located in greater Vancouver).

Data Linking, common or integrated program or activity

Personal information that The City collects is not used for data linking within the meaning of *FIPPA*. The program is operated by The City, it is not a common or integrated program or activity as defined in *FIPPA*.

No information-sharing agreements contemplated

Except as required by law, the City is not intending to share personal information collected or compiled through the program under an information-sharing arrangement or agreement with other entity. If an information-sharing arrangement agreement is contemplated at any future date, the City will conduct a PIA or Privacy Risk Assessment before determining whether to proceed.

Accuracy, Completeness, Correction

Personal information will be collected from the individuals involved, through their completion of the various forms.

Requests for access to or correction of personal information will be made to the City 's Privacy Office.

Retention, Disposal

The City will retain personal information for at least one year after making its decision on the application for which that information was provided. Further, the City will retain the information in accordance with its records retention and disposition schedules. The information will be securely destroyed when permitted under those schedules.

Security

This section describes the administrative, physical and technical security measures that will be implemented to protect personal information. This Review did not have an opportunity to review any contracts between vendors and the City. A *STRA* - Security Threat Risk Assessment (which fully documents security controls and risk mitigation) was not completed. STRA's are mandatory for provincial government undertakings and considered a best practice.

Administrative Measures

Access to and use of personal information that is collected will be restricted to employees who require that information to perform their duties and functions. Personal information that is collected from individuals through the application process will be stored electronically on the City 's servers that are accessible only to those who are authorized to have access. Specifically, access to personal information will be restricted by role-based access permissions issued and maintained by the City 's IT department.

Technical Security Measures

Personal information will be stored in the City's servers as indicated above.

Physical Security Measures

Access to personal information is protected by physical security measures including password protected systems, card swipe access to the City work space and industry standard IT security measures.

Findings and Recommendations

The nature of our Review was not to identify every potential privacy risk; rather, it was to identify those issues and risks specific to the program in scope. The specific risk findings and recommendations arise

from our review of documentation and the meetings and discussions with staff. Although many topics were covered in those discussions, this section makes mention only of those topics that may give rise to measurable privacy risks or issues for the organization. More detail regarding the findings may be found in the Appendix of this Report.

Key to mitigating risks associated with the proposed system is ensuring staff of the City are aware of policies limiting access, use, and disclosure of personal data and how these policies protect the City and the public. Further, policy education and awareness surrounding protecting privacy is a continual process that must be updated as programs change or as legislation and regulations governing personal information collection, use and disclosure evolve over time.
The City has the responsibility of ensuring that its employees have completed training about the appropriate use and sharing of personal data. Policies should be easily accessible by employees and, ideally available to the public as well. Staff should be educated and informed about how privacy policies will be enforced, including consequences for violations of the policies.

Our detailed findings for the proposed system covers the following:

Access and role-based Permissions

Access to the personal information should be in compliance with FIPPA and therefore granted on a need-to-know basis for those individuals who require the access to perform their work duties. Specific roles that may be given access to the data are to be determined and will be defined in policies.

Disclosure of Personal Information

Individuals from the public or business organizations must file a *FIPPA* request to be given access to the data, in which all information exempted from disclosure would be severed (removed) by FOI staff in the City Clerk's office. Responses to requests under *FIPPA* may be subject to fees as set out in *FIPPA* and the Richmond Fees and Service Bylaws.

Retention of Personal Information

Personal information must be stored in secure location and should comply with the Richmond's records management policies and bylaws. Personal information should be set on a retention schedule in accordance with the City's records management and retention policies. Further to *FIPPA* requirements, all recorded data and information should be stored and only accessed inside Canada.

Public Notification and Transparency

Richmond should exercise a high degree of care to protect privacy rights. Privacy notice requirements in *FIPPA* regulations require that notification should be provided at the time of collection of personal information and include the following information:

- What authority the City has to collect the data (Section 26 of *FIPPA*)
- The individual responsible for the collection of the data and the address or contact information of the individual responsible for the collection of the data

Privacy Breach Mitigation

City staff and contractors using the platform should be required to report immediately any unauthorized collection, use or disclosure of personal information to the City Clerk's office.

Privacy Risk Register

Risk Description	Risk Likelihood	Risk Consequence	Owner	Recommendation to Address or Mitigate Risk
Notice or consent provisions should be included in all forms where information is collected from customers	*Low*	*High*	*City Clerks Office*	*Notice and consent provisions are included in all forms where information is collected from customers.* ***Recommendation:*** *Ensure notice or consent provisions to all forms where personal information is collected - see Appendix for definition of personal information*
Use MyRichmond is being enhanced to provision accounts on PerfectMind automatically upon registration. E-mail, first name, last name, primary phone number, and second number will be used to provision accounts on PerfectMind.	*Low*	*Low*	*IT*	The automatic provisioning is appropriate from a disclosure point of view.
Security – (FIPPA Section 30) *Employee could access personal information and use or disclose it for personal purposes (including an employee of a service provider)*	*Medium*	*High*	*CIO*	*The City's "Use of Information Technology Resources – Policy/Procedures and Protocols" Policy provides direction and defines accountabilities for acceptable use of The City 's computing and technological facilities.*
Protection of Personal Information	*Low*	*Low*	*CIO, City Clerks Office*	*The project indicates that no personal information will be stored outside of Canada and has*

Risk of noncompliance FIPPA S.30.1 (Storage/Access outside of Canada)				*documented the controls and risk mitigation.*
Outbound – "push" notifications *The Canadian Anti Spam Legislation (CASL) imposes strict requirement on organizations that use electronic channels to promote or market the organization, products or services.*	*Low*	*Low*	*City Clerks Office*	*The current design does not include "push" or outbound notifications. If use of this function is considered the City should perform further Assessments to ensure compliance with legislative requirements.* [4]
Accuracy, Correction, Retention of Personal Information *Personal information may be retained for longer than necessary. The City will be responsible for ensuring that the personal information stored on their systems is appropriately retained and destroyed.*	*Low*	*Low*	*CIO, City Clerks Office*	***It is recommended that where required, data retention, accuracy and correction policies should be in place or created.*** *Records retention and disposition schedules will ensure that personal information is kept for at least one year after it is used to directly affect an individual. While the City undertakes to take all necessary, reasonable steps to aid in complying with retention/disposition requirements, there is a risk that information may be retained longer than necessary.*
Risk of absence or incomplete governance relating to government data	*Low*	*Low*	*CIO, City Clerks Office*	***It is recommended that the City develop any required policies, procedures and training required to support security and privacy governance as recommended in the "Public Sector Privacy Management and Accountability Policy". (need to document policies)*** *Security and privacy requirements*

[4] Canadian Anti-Spam Legislation (CASL) http://laws-lois.justice.gc.ca/eng/acts/E-1.6/index.html

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				should be communicated to relevant staff to support compliance.

Summary

The specific risk findings and recommendations arise from our review of documentation and meetings and discussions with staff. Although many topics were covered in those discussions, this section makes mention only of those topics that may give rise to measurable privacy risks or issues for the organization.

As this Review documents, the City has the necessary authority to collect, use and disclose personal information for the proposed program's purposes. This Review also determines that the program will include appropriate measures to protect personal information from such risks as unauthorized access, collection, use, disclosure or disposal, and only the necessary personal information will be collected. As mentioned, further PIA's or Risk Assessments for related applications are under way, and as new related services are considered, Finally, through post implementation further Assessments may be required to ensure the programs delivered match those proposed.

Appendix 1:

Freedom of Information and Protection of Privacy Act (FIPPA)

The purpose of *FIPPA* is to provide a right of access to information under the control of institutions in accordance with the principles that, information should be available to the public, necessary exemptions from the right of access should be limited and specific, and decisions on the disclosure of government information should be reviewed independently of government; and to protect the privacy of individuals with respect to personal information about themselves held by institutions and to provide individuals with a right of access to that information - https://www.oipc.bc.ca/about/legislation/ .

The provisions of Part 3 of *FIPPA* apply to **personal information** – that is, recorded information about an identifiable individual – in the custody or under the control of a public body. **"Personal information"** means recorded information about an identifiable individual other than contact information. **"Contact information"** means information to enable an individual at a place of business to be contacted and includes the name, position name or title, business telephone number, business address, business email or business fax number of the individual. https://www.oipc.bc.ca/about/legislation/

Appendix 2:

Privacy Compliance

Planning Stage

	Question	Response	If Applicable,

			Indicate the Document Where This is Addressed
1	Who is responsible on behalf of the City for compliance with legislation and privacy principles pertaining to the information involved in the project?	Head of the Public Body	
2	Why is this collection of customer information required?	Support the administration, delivery of the programs	
3	Will collected customer information be used for data matching, data analysis or data profiling? Will it be anonymized?	Not intended at this point	
4	Will collected customer information be linked or cross referenced to other information systems, technologies or programs? Will it be anonymized?	Yes, as required to delivery common programs and to ensure compliance	
5	Will collected customer information be used for planning, forecasting or evaluation? Will it be anonymized?	Yes, anonymized where required. If personal information is aggregated or anonymized this is not a concern.	
6	Will there be secondary purposes for data collection?	No	
7	How are customers informed of the purposes and authority of data collection?	Notice and/or consent are provided	
8	Can customers opt out of data collection?	No	Personal information is required to register for programs. Process in place to limit the amount of personal information collected is available on request.
9	How do customers consent to this use and disclosure of their personal information?	Consent collected at program registration	
10	What alternative is provided to customers who do not consent to this collection, use and disclosure of their personal information?	Alternative provided	
11	How long will the collected information be retained?	Personal information is subject to the City's	

		retention schedules	
12	How will accuracy of information be assured?	Accountability rests with customers	
14	Will the privacy and security measures on data collection and handling be made available customers?	Yes, through communication at rollout of solution	It is recommended that as the project is rolled out to customers, the City advise customers that appropriate privacy provisions in place.
15	How will customers be able to access their information?	Customer may access their information via MyRichmond.ca, customers may also contact the City to access their information.	Processes in place
16	Who is responsible for addressing a challenge concerning compliance with privacy principles and data protection for the information collection?	Privacy Office	
17	If the information is being stored outside of Canada, what are the legal considerations for the collection, transmission, storage, disposal and authority of information?		Personal information is not store/accessed outside of Canada
18	Have key stakeholders have been provided with an opportunity to comment on the sufficiency of privacy protections and their implications on the proposed/existing solution?	No	
19	Have you contacted other organizations who have implemented the same solution to discuss about the risks planned for and issues encountered? Please provide feedback.	No	

	Question	**Response**	**If Applicable, Indicate the Document Where This is Addressed**
1	Which employees or positions have access to the customer information records.	Required employees have access to Customer personal information	
2	Will user activities be monitored for security and	No	*Use of*

	quality assurance purposes?		*Information Technology Resources – Policy/Procedures and Protocols*
3	Will customer information be disclosed to any persons who are not employees of the City?	No	
4	What control mechanisms are in place to monitor user accounts, access rights and security authorizations within the system?	Controls in place	*Use of Information Technology Resources – Policy/Procedures and Protocols*
5	What protocols are in place to ensure stored customer information is accurate, complete and up-to-date?	Accountability rests with customers	
6	How will customer information be updated?	Accountability rests with customers	
7	Does a log exist to track any changes made to stored customer information in the system?	No	
8	What are the protocols in place to identify security breaches or disclosures of Customer information in error?	No protocol in place, protocol to be developed	
9	How will users be notified of a compromise of security or loss of data?	Contacted by Privacy Office or designate	
10	How will requests from customers for access to and correction of personal information be recorded and tracked?	Customer can access and correct personal information via self serve. Formal FOI process also available, request recorded by staff member accepting the request, City Clerks office logs requests pursuant to FOI.	

Implementation, Post Implementation Stages

	Question	**Response**	**If Applicable, Indicate the Document Where This is Addressed**
1	Has your staff been formally trained for handling personal information?	Trained at onboarding, privacy training provided	
2	Has the Privacy Risk Assessment been fully completed?	Yes	

3	Is there a planned Post Implementation Review to ensure compliance?	Yes, as required.	

Appendix 4:
Documents Reviewed

- British Columbia Freedom of Information and Protection of Privacy Act *(FIPPA)* www.oipc.bc.ca/about/legislation
- *Accountable Privacy Management in BC's Private Sector"* published by the Office of the Information and Privacy Commissioner of BC
- City of Richmond – *Digital Strategy (updated 2016)*
- City of Richmond - *Use of Information Technology Resources – Policy/Procedures and Protocols*
- Radical I/O Technology Inc – *My Richmond Architecture and Design Feb. 2018 (V5.0)*
- City Richmond – *Personal Data Elements List (Data Model Customer Profile)*
- City of Richmond - *Contractor Agreement: "CITYHALL-#5430725-v1 HCA UME Contractor Agreement"*
- City of Richmond - *Association Staff Instructor Manual: "CITYHALL #5186475-v5 City-wide Seasonal Instructor Manual*
- City of Richmond – *Customer Profile Service Project Charter 2017-03-16*
- *City of* Richmond - *"Privacy Policy Statement for the City of Richmond Registration System.pdf"*
- City of Richmond – *Registration Page Privacy Statement* https://myprofile.richmond.ca:8043/#register
- City of Richmond – *PerfectMind Business requirements and Solution Design Document (BRSDD)*
- City of Richmond – *Non-Disclosure document (signed by staff)*

Appendix 5: Data Flows (detailed)

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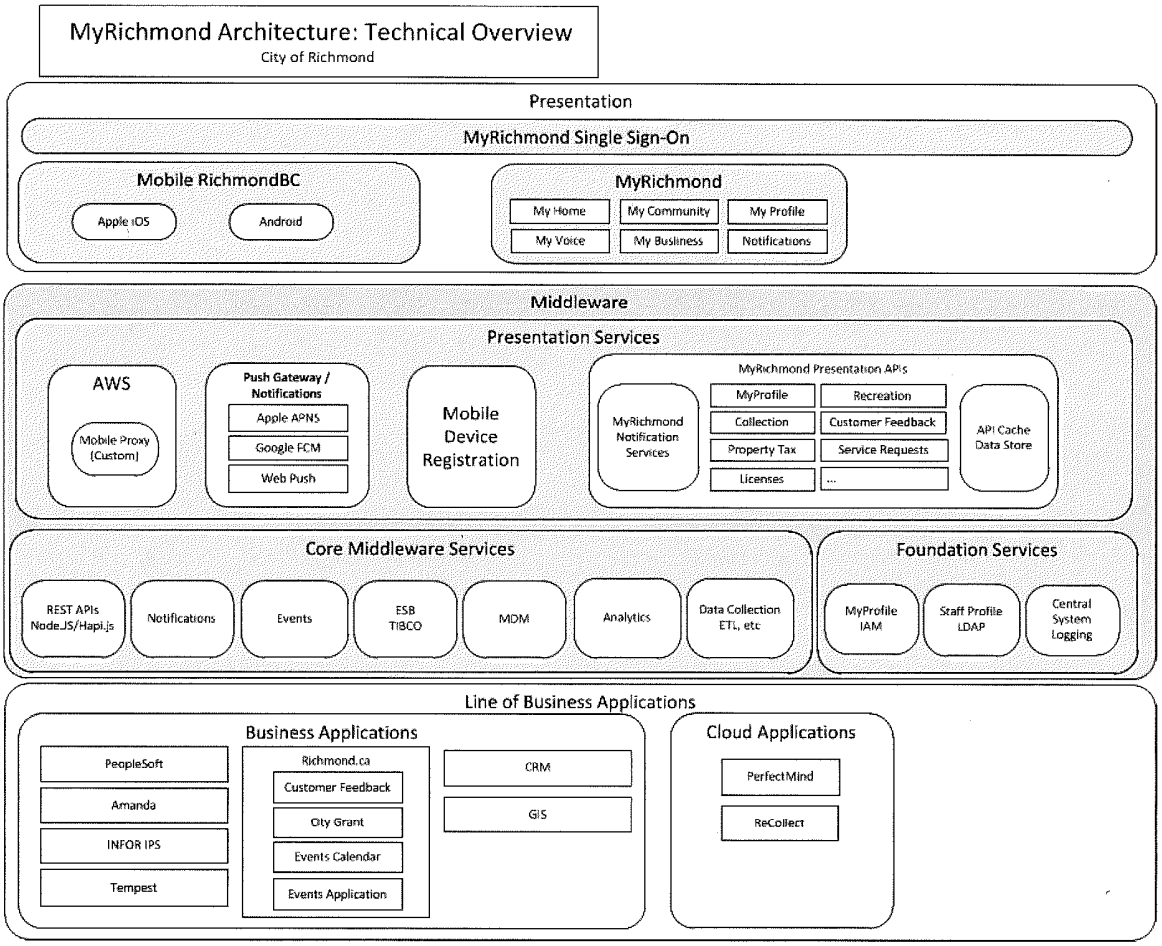
MyRichmond Architecture: Technical Overview
City of Richmond
Presentation
MyRichmond Single Sign-On
Mobile RichmondBC
Apple iOS
Android
MyRichmond
My Home
My Community
My Profile
My Voice
My Business
Notifications
Middleware
Presentation Services
AWS
Mobile Proxy (Custom)
Push Gateway / Notifications
Apple APNS
Google FCM
Web Push
Mobile Device Registration
MyRichmond Presentation APIs
MyRichmond Notification Services
MyProfile
Recreation
Collection
Customer Feedback
Property Tax
Service Requests
Licenses
...
API Cache Data Store
Core Middleware Services
REST APIs Node.JS/Hapi.js
Notifications
Events
ESB TIBCO
MDM
Analytics
Data Collection ETL, etc
Foundation Services
MyProfile IAM
Staff Profile LDAP
Central System Logging
Line of Business Applications
Business Applications
PeopleSoft
Amanda
INFOR IPS
Tempest
Richmond.ca
Customer Feedback
City Grant
Events Calendar
Events Application
CRM
GIS
Cloud Applications
PerfectMind
ReCollect

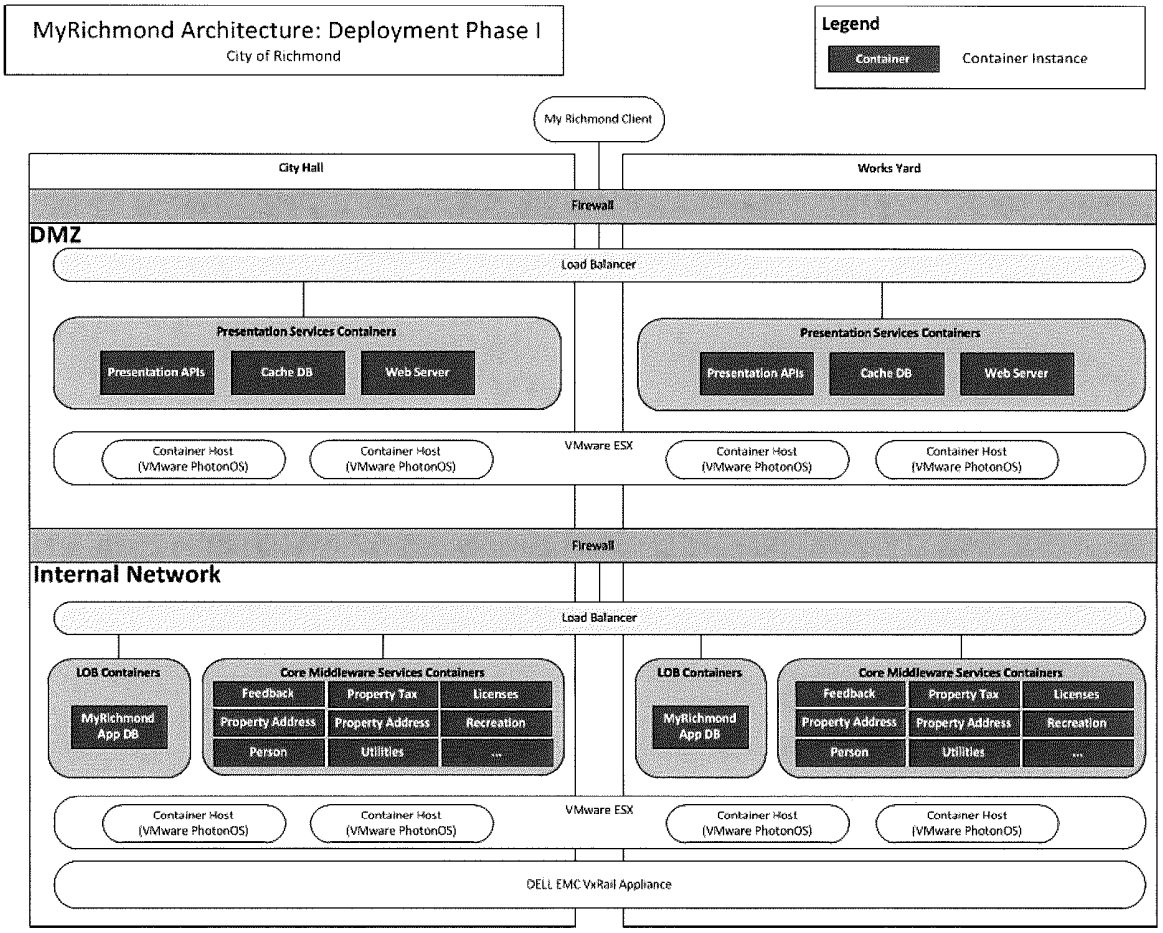
MyRichmond Architecture: Deployment Phase I
City of Richmond
Legend
Container
Container Instance
My Richmond Client
City Hall
Works Yard
Firewall
DMZ
Load Balancer
Presentation Services Containers
Presentation APIs
Cache DB
Web Server
Presentation Services Containers
Presentation APIs
Cache DB
Web Server
Container Host (VMware PhotonOS)
Container Host (VMware PhotonOS)
VMware ESX
Container Host (VMware PhotonOS)
Container Host (VMware PhotonOS)
Firewall
Internal Network
Load Balancer
LOB Containers
MyRichmond App DB
Core Middleware Services Containers
Feedback
Property Tax
Licenses
Property Address
Property Address
Recreation
Person
Utilities
...
LOB Containers
MyRichmond App DB
Core Middleware Services Containers
Feedback
Property Tax
Licenses
Property Address
Property Address
Recreation
Person
Utilities
...
Container Host (VMware PhotonOS)
Container Host (VMware PhotonOS)
VMware ESX
Container Host (VMware PhotonOS)
Container Host (VMware PhotonOS)
DELL EMC VxRail Appliance

Table 8.7.2 Estimated Funding Allocated for the Innovation Superclusters Initiative

FUNDER	STATUS	AMOUNT
MDA	Confirmed	$ 600,000
Amazon	Confirmed – In Kind	$ 200,000
Other Tech Companies (Radical I/O and others)	Confirmed – In Kind	$ 200,000
Province of BC	Confirmed	$ 600,000
Other Contribution	TBD	$ 250,000
Other Contribution	TBD	$ 250,000
Emergency Management BC	TBD	$ -
City of Richmond	Via Sensors (from 2017/18 budget)	$ 500,000-
City of Richmond	New sensors required	$ 100,000
Federal Super Cluster Initiative	TBD	$ 2,700,000*
TOTAL		$ 5,400,000**

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Richmond

Project Implementation Plan – Smart Cities Challenge – 1.2 Sustainable Transportation

A project of the City of Richmond

Project Implementation Plan Purpose

The Project Implementation Plan is the governing document that defines how the project will be executed, monitored, controlled, and closed. This Plan established the framework for project delivery and describes the objectives, scope, schedule, structure, approach and major deliverables. It also serves as an agreement between the Project Sponsor(s), Project Team and the Department on the established project framework and direction.

*Note: 1) Guidelines for completing this document are provided in each section in italicized text, which can be removed.
2) Sections and sub-sections can be removed or added as deemed appropriate by the Project Team.

Project Title: Smart Cities Challenge – 1.2 Sustainable Transportation

Project Duration:	5 years
Project Sponsor(s):	Smart Cities Challenge Project Office
Project Manager:	TBD
Project Implementation Plan Prepared by:	Peter Russell, Sr. Manager, Sustainability & District Energy

1.0 Project Overview

Brief Project Description: This project aims to expand access to sustainable mobility options by creating a series of mobility hubs that combine electric vehicle charging infrastructure, access to shared cars and bikes and transit services. The City also aims to integrate planning for autonomous and electric vehicles while continuing to support for transit infrastructure and develop first and last mile solutions. Outcomes that City is aiming for are to: increase electric vehicle ownership, increase transit use and increase use and access to the shared mobility options.

Project Background	The City's Official Community Plan and Community Energy Emissions Plan both call for reducing greenhouse gas emissions from transportation sources. It is estimated that 53% of Richmond's community greenhouse gas emissions are from transportation sources. Personal vehicle use represents approximately 41% of the community emissions on its own. The Province of BC recently announced that new passenger vehicles sold in BC will be 100% zero emissions by 2040. The electrification of all modes of transportation is an important opportunity for the City and region to reduce GHG emissions. Expanded electric mobility options also increases the City's resilience in the event of disruptions in fossil fuel services and supplies as a result of a major disaster (locally through to international sources). Expanding mobility options available to residents addresses social and economic objectives articulated in the Resilient Economy, Social Development and Community Wellness Strategies by offering: broader (when compared to individual car ownership) mobility options; workforce mobility options for getting to work; health benefits for residents that comes with active transportation; and, affordable mobility options for low and no income

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<table>
<tr><td></td><td colspan="2">residents.</td></tr>
<tr><td>Project Objectives</td><td colspan="2">The Community Energy & Emissions Plans and OCP both have targets to shift travel modes for all trips to active modes (transit, walking, cycling, etc.) for 50% of trips. Making this shift will also reduce greenhouse gas emissions, as will increases in electric vehicle ownership. In this context, sustainability transportation projects outcomes include:
1 50% increase in resident ownership of EVs over base line
2 Supporting 100% electrification of transit fleet with TransLink
3 30% decrease in GHG emissions from mode shift to sustainable transportation modes
4 50% of all trips by sustainable transportation modes (transit, cycling, walking)
5 AEV-ready transportation system that is implemented to support transit infrastructure (e.g. a “first and last mile” focus)
6 100% connectivity of people and vehicles to wireless networks to enable seamless trips and provide equitable access to services</td></tr>
<tr><td>Strategic Alignment</td><td colspan="2">Relate the project to the Smart Cities Vision and Challenge Statement.
Relate the project to other existing strategic plans, policies, Council Term Goals, institutional core values/goals/practices, etc., as appropriate. This provides an indication of the project’s strategic importance.</td></tr>
<tr><td></td><td>City of Richmond Strategy (REDMS number where available)</td><td>Alignment</td></tr>
<tr><td></td><td>Smart Cities Vision and Challenge Statement</td><td>• Access to a range of mobility options during an emergency/disaster post-disaster situation enables residents to access safe sustainable mobility options
• Access to a range of mobility seamless options for day to day transportation needs in support of City GHG/active living/equity goals
• Mobility Hubs will coincide with Intelligent Operations Hub enabling residents access to mobility services during emergency events
• Mobility Hubs will benefit from way-finding strategies</td></tr>
<tr><td></td><td>Digital Strategy</td><td>• Access to information systems through MyRichmond app that connect residents/businesses with sustainable mobility options</td></tr>
<tr><td></td><td>Official Community Plan</td><td>• The City’s Official Community Plan and Community Energy Emissions Plan both call for reducing greenhouse gas emissions from transportation sources
• OCP supports “the adoption of plug-in electric vehicles and other vehicle technologies that can emit zero greenhouse gas and air contaminant emissions.”
• OCP supports creating everyday transportation choices.</td></tr>
</table>

		• OCP targets 50% of all trips by sustainable transportation modes (transit, cycling, walking)
	Community Energy and Emissions Plan	• This project will help to promote low carbon personal vehicles, and expand the network of charging stations within the city
Related Projects	*Identify any other projects or organizational initiatives currently underway that may impact or be impacted by this project. Identify the relationship and any dependencies (e.g. prerequisite).*	
	Project	**Impact (including relationship & dependencies)**
	• TransLink has established a new group called New Mobility Services with a focus on ensuring that advances in transportation and communications technologies support regional goals. New mobility concepts to be explored include shared use mobility services, vehicle automation and integrating incentives and payment across transportation services.	• The City's projects are very aligned with the mandate of the New Mobility group. Mobility Hubs would bring together a number of mobility options that are linked via technology for integration payment ("Mobility as a Service" system)
	• TransLink (and Coast Mountain Bus Company) approved a new target for 100% renewable energy by 2050. The goal covers fleets, including both transit and service vehicles, along with all buildings and facilities.	• Positive impact as charging infrastructure will expand regionally • Transit buses in Richmond are currently exclusively diesel or diesel/hybrid powered. Electric buses will reduce transportation related GHG emissions in Richmond
	• 12 existing charging stations plus $300,000 capital projects to install Level 2/DC Fast Charge equipment installations at City Hall and the Oval	• The City has current information EV Charging Usage from ChargePoint to use to forecast usage in future areas, the City has seen a nine-fold increase in usage since 2015; charging has been free • The City is implementing a parking fee for recovering maintenance and replacement costs for using City EV charging infrastructure, also to fund new stations as EV uptake occurs; a new fee may impact charging infrastructure usage rates however growth in EV ownership could be expected to address this issue
	• 100% energized parking stalls in new residential development zoning requirements	• Positive impact in that the new requirement is expected to increase EV ownership, in particular in new multi-family buildings
	• Regional Autonomous Electric Vehicles initiatives (Vancouver,	• Positive impact in that all active cities will be able to learn from each other

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	Surrey, Richmond, etc)	
	• City Policy is that when replacing vehicles that EVs are the first choice unless operation needs exceed vehicles performance. Capital work to expand EV charging for Fleet at City Hall/Annex and Works Yard in 2019.	• Positive impact in that power infrastructure for City EV fleet expansion can be shared to provide energy for EV chargers for private EV owners at these locations
	• Web-based system displays all charging stations locations, reservations, and whether they are in use using either web or phone based apps	• This data source could provide reservations, information to MyRichmond regarding available charging stations
	• 4 companies with vehicles in Richmond including Modo-City pilot partnership	• The City has experience attracting and working with share car service providers. A full service provider led program has yet to roll out in Richmond due to low demand however given the densification occurring in the city, the pilot projects will enable to be prepared when demand is higher.
Project Strategy and Approach	The City will establish an interdepartmental EV infrastructure working group, identify the key industry stakeholders and programs, and establish a community and business EV user and infrastructure group. The City will conduct a gap analysis as precursor information for the Sustainable Mobility Strategy. The Strategy, though technical analysis and engagement, will identify a city-wide network of locations for a hierarchy of mobility hubs. The typology/tier of each mobility hub location should be based on neighbourhood characteristics, transportation needs, built environment (e.g., local, central or regional), connections to resiliency hubs. Two pilot project sites that best demonstrate the concept will be selected and implemented within 5 years. EV charging infrastructure will be prioritized in candidate sites identified in the strategy. Over time, the City intends to construct more Mobility Hubs through capital investments and/or through working with major development proponents. Progress towards travel mode and GHG emission reduction targets will be tracked. The City will also identify key policy, program, partnership, cost sharing and funding tools to support the increase of access to and usage of EVs and Mobility Hubs throughout the City. Long term, The Sustainable Mobility Strategy will identify opportunities for equity and to future proof EV charging and Mobility Hub infrastructure to allow inclusion of autonomous vehicles.	

2.0 Project Organization & Management

Project Governance	*Section to be completed by Project Office*
Resource Requirem	*This section lays out the overall internal and external resources required to ensure successful completion of the project.*

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ents	Internal Resources *Identify each internal resource, their respective roles and responsibilities related to the project, and an estimate of the time commitment required.*				
	Name and Title		**Role**	**Responsibility**	**Time Estimate (FTE)**
	1.	Corporate Energy Manager	• Project Manager	• Responsible for overseeing implementation of project actions and to provide guidance on project initiatives • Responsible for organizing internal and external resources and ensuring overall program stays on scope, budget, and schedule.	0.10 FTE **Existing Role**
	2.	Fleet Operations, EV infrastructure Manager	• Subject matter expert	• Responsible for providing expertise in regards to EV infrastructure options and technology implementing project actions and to help guide project initiatives • Responsible for organizing internal and external resources and ensuring overall program stays on scope, budget, and schedule. Has ultimate authority over project	0.10 FTE **New Role**
	3.	Operations Clerk	• Project coordinator, implementation lead	• An internal project resource to help complete action items and priorities, and responsible for overall day to day management including the required coordination and reporting on the EV infrastructure use and performance..	1.0 FTE **NEW ROLE**
	4.	Residential EV charging station advisor	• Residential Charging Infrastructure Advisor	• Through a future Council approval procure staff funding or external consulting funding, to provide support services to residences, helping interested home owners and stratas obtain information on incentives available and what provide information on what infrastructure installations and enhancements would be required.	0.5 – 1.0 FTE **NEW ROLE**
	5.	City Transportation Planning Advisor	• Planning support	• Help to support the City's Mobility Hub strategy initiatives and provide guidance on policy measures that can put in place through permitting requirements. • Provide guidance on policy	0.05 FTE **Existing Role**

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				measures that can be implemented to accelerate the development of Mobility Hubs.	
	6.	City Planning Advisor	• Planning support	• Help to support the City's EV home and commercial retrofit strategy initiatives and provide guidance on policy measures that can put in place through permitting requirements. • Provide guidance on policy measures that can be implemented to increase the installed EV charging capacity in new commercial developments • Assistance in identifying potential mobility hub opportunities	0.05 FTE **Existing Role**
	7.	IT Technician	• IT Technical/Support	• Key internal contact with the City's IT Department to act as an support person for project requirements	0.05 FTE **Existing Role**
	8.	Development Applications Planner	• Secure Hubs through development application processes	• Secure provision of Mobility Hub on private property as part of development requirement • Provide guidance on policy measures that can be implemented to accelerate the development of Mobility Hubs. • Preparation of report to Council seeking approval of development application • Liaison with private developer • Assist project management office with securing necessary planning approvals	0.1 FTE **Existing Role**
	9.	Public Works Supervisor	• Project / Construction Management	• Manage design and construction of Mobility Hub on City property • Coordinate provision of assets with external partners	0.1 FTE **Existing Role**
	10.	Sustainability Project Manager or Sustainability Manager	• Subject Matter Expert Capital requests and prioritization of Hubs and EV Charging per the Sustainable Mobility Strategy	• Provide expertise related to identification, planning, design, implementation, monitoring	0.1 FTE **Existing Role**

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External Resources / Partners

If external resources will be required for the project, identify the type of resource(s) required, their respective role related to the project and estimates on time and cost for the resource. Identify all partners and their role, capacity and readiness.

Include technology partners, vendors, government, educational, advisory, community, etc.

	Resource Type	Role & Responsibility	Time and cost	Capacity & Readiness
1.	TransLink - New Mobility Group, Coast Mountain Bus Company	• Align regional players with regional plans/policies; communicate best practices • Potential means of connected payment system (Compass Card) for trips across different modes • Cost-share funding for cycling infrastructure and transit priority measures • Support facilitation and regulation of shared mobility services Provide updates on TransLink's bus electrification plan and information on what opportunities exist for the City to facilitate and implement this plan in Richmond.	In-kind staff resources	Stakeholder has stated interest working with the City to define mobility hub functions related to transit
2.	BC Hydro	• 100% electrification of bus fleet	In-kind staff resources	Stakeholder has stated interest working with the City to deploy electric buses in Richmond as part of any early pilot deployment projects.
4.	Public Bike Share Services The City is currently contracting the	Supply, operation and maintenance of fleet of bicycles and/or e-bikes in City Centre and mobility hubs	Services for users through individual transactions	The City is currently in an 18 month pilot with U-bicycle

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		services of U-Bicycle as a pilot program			
	5.	EV Charging The City is currently contracting the services of Chargepoint	Provide industry insights for expanded infrastructure and cost Current EV charging station service provider	$15,000 per Level 2 installation, $75,000 per Level 3 installation, -$260 annually per port for Level 2 chargers and $520 annually per port for Level 3 chargers. Services for users through individual transactions The City is implementing a new parking fee for access to charging stations to recover operating and replacement costs.	The City is currently contracting the services of Chargepoint.
	6.	Ride-Hailing Operator	Provide service to/from Mobility Hub on demand	Time: on-going Cost: no cost to City; service provided as part of regular business operations	Not currently engaged, consultation will be carried out.
	7.	Taxicab Operator	Provide service to/from Mobility Hub on demand	Time: on-going Cost: no cost to City; service provided as part of regular business operations	Not currently engaged, consultation will be carried out.
	8.	Supplier of transit shelters	Supply transit shelters with "smart" features (e.g., real-time info, way-finding, Wi-Fi)	Time: on-going Cost: $50,000-$100,000 per shelter	The City has a contract with Pattison Group for bus shelter adverts; the City has access to the system for way-finding or promoting City services/events.
	9.	Car-Share Operator	Provide car-share vehicle(s) at Mobility Hub	Time: on-going Cost: no cost to City; service provided as part of	Modo currently operating a car Share program with the City

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				regular business operations	
	10.	Strata Managers Association	Collaborate and direction with regards increasing EV charging infrastructure in existing MURBs	TBD	TBD
	11.	EV Vendors and Retailers	Work with the City to expand EV ownership	Marketing and EV charging infrastructure funding	The City has engaged Auto West Group regarding the provision of EV chargers through a sponsorship model
	12.	Vendors of bicycle and pedestrian counters	Provide equipment to track active transportation trips across the city over time	One-time installation $5,000 per counter 18 locations	City has engaged with a vendor to identity the appropriate equipment
	13.	Development Community	Provide feedback on Sustainable mobility strategy and partner for development of mobility hubs	Ongoing	TBD

Committees	*Specify all committees that have been, or will be, established to support the undertaking of the project (e.g. Advisory, Steering, Working Committee, etc.). Identify each group, department, or organization on the committee (both internal and external). Consider how local private and/or academic sectors will be engaged to help determine solutions.*		
	Committee	**Purpose of Committee**	**Membership**
	Public Works & Transportation Committee	This committee receives and approves most reports related to this goal area.	Select Members of Council
	Advisory Committee on the Environment	Advisory committee who are engaged as needed for receiving support or gaining feedback	External as approved by Council with at least one designated councillor
	Economic Advisory Committee	Advisory committee who are engaged as needed for receiving support or gaining feedback	External as approved by Council with at least one designated councillor

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	Richmond Active Transportation Committee	Advisory committee who are engaged as needed for receiving support or gaining feedback	External (as determined by City staff; no Council liaison as not a formal advisory committee)
	Smart Cities Ad-Hoc Stakeholder Group for 1.2	Small stakeholder event was held as part of developing plan, this group will be consulted again as the City moves forward with implementation	External service providers
	Planning Committee	Endorsement/direction for statutory land use approvals	Select members of Council
	Sustainable Mobility Working Group (NEW)	Guidance on the development of the Sustainable Mobility Plan and related Programs	Staff from multiple departments

Project Communication (internal)	*Describe the timing and nature of regular project related communication activities (e.g. meetings, meeting minutes, project status reports, etc.). Consider the core project team, internal/external resources involved, and any established special committees (or other project related factors).* Communications will be coordinated by Corporate Communications to the public. To develop the Sustainable Mobility Strategy, stakeholders will be invited to workshops and the public will be invited to online surveys (via Let's Talk Richmond) and invited to at least one public open house. Ongoing through implementation, ad hoc or formal groups will be introduced as needed. For instance, it may be required to strike a working group to construct a mobility hub in an existing community centre.

Performance Measurement & Reporting	• Sustainable Mobility Strategy (a City-Wide network plan/Mobility Hub Strategy) to be presented to Council for adoption • Trend of Mode Split: o Census (Federal Government): trend of mode split for journey to work trips in Richmond o Trip Diary (TransLink): trend of mode split for all trips in Richmond o Active Transportation Trips: data from counters installed on various trails and greenways • Car-Share Usage: membership in Richmond, # of trips per car per day, trips originating

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	or terminating at a mobility hub • Bike-Share Usage: membership in Richmond, # of trips per bike per day, O-D, trip length, trip time • EV Charging Usage: hours of use, energy used, number of sessions used • Secure Bike Parking: capacity utilization per day • GHG savings • Commercial EV charging stations in the City

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3.0 Project Definition

Scope *Describe the project scope which is the work to be done to complete this project. The scope should relate back to the project objectives/outcomes and establish project limits and boundaries in terms of activities and work to be performed. The project scope needs to be measurable. Identify the scope boundaries and anything explicitly outside the project scope that may not be immediately obvious.*	Multi-modal mobility hubs are transportation network nodes designed to seamlessly integrate multiple travel modes in one location. Supportive infrastructure and place-making strategies create pedestrian-oriented centres that maximize first-to-last kilometre connectivity without the need for private vehicles. During a major event, mobility hubs are gathering points that identify safe priority routes and modes. The City will establish an interdepartmental Sustainable Mobility Working Group to identify the key industry stakeholders and programs and establish a community and business EV user and infrastructure group. The City will conduct a gap analysis as precursor information for the Sustainable Mobility Strategy. The Strategy, though technical analysis and engagement, will be developed to identify a city-wide network of mobility hubs. The typology/tier of mobility hub locations will be based on neighbourhood characteristics, transportation needs, built environment (e.g., local, central or regional), connections to resiliency hubs. Two pilot project sites that best demonstrate the concept will be selected and implemented within 5 years. EV charging infrastructure will be prioritized in candidate sites identified in the strategy. Overtime, the City intends to construct more Mobility Hubs through capital investments and/or through working with major development proponents. Progress towards travel mode and GHG emission reduction targets will be tracked. The City will also identify key policy, program, partnership, cost sharing and funding tools to support the increase of EV usage and Mobility Hubs throughout the City. Long term, The Sustainable Mobility Strategy will identify opportunities to future proof EV charging and Mobility Hub infrastructure to allow inclusion autonomous vehicles.
Major Material	• EV charging stations for transit and personal vehicles (private, car-share, ride-hailing, taxi) and e-bikes • Parking/loading areas for car-share, taxi and ride-hailing vehicles and future AVs • Dynamic parking management system • Electrical load and EV charging station management system • Bike-share station, secure short- and long-term bicycle parking, bike repair station • Conventional transit and HandyDART stops and shelters with real-time information in accessible formats • Accessible and barrier free design • Free public Wi-Fi, way-finding (signage, maps, digital platform), weather-protected waiting areas, solar-powered lighting, lockers, washrooms, litter-recycling receptacles, seating • Open platform/app to display where and what mobility hub assets are available including GIS-based marker and locator to designate mobility hub for display on app • Priority EV charging and servicing during major events for city fleet and emergency response vehicles. • Pedestrian and bicycle counters to track active transportation trips
Work Breakdown Structure	*Use this section to develop a detailed Work Breakdown Structure listing the deliverables or work components within each of the project's lifecycle stages*

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	WBS Code	Title	Breakdown of deliverables
	1	**Initiation**	
	1.1	Identification	- Establish an interdepartmental Sustainable Mobility Working Group; Identify the key industry stakeholders and programs and establish a community and business EV user and infrastructure group - Conduct a gap analysis/inventory of current programs, policies and infrastructure as base information to lead the Sustainable Mobility Strategy - Identify key City policies and programs that could be used to support the increase of EV use in the City - Identify opportunities to future proof EV infrastructure components to allow for potential autonomous vehicle routes - Determine what cost sharing / partnering opportunities to support implementation of public and private electric vehicle infrastructure in Richmond

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	1.2	Planning	Develop the Ph. 1 scope (1-5 yrs) of a Sustainable Mobility Strategy for all vehicle types (light duty/passenger cars, heavy equipment and buses), with funding support from BC Hydro. Initial scope considerations include: - Scales of Mobility Hubs by location with co-location of charging stations for all modes with a focus on L3/DCFC - Infrastructure capital and operating funding requirements and cost-recovery strategies. - Partnering opportunities with other EV users such as Coast Mountain Bus Company, Westcoast Sightseeing, etc - Retrofit programs for retrofitting existing buildings with EV charging infrastructure - Service delivery models for implementing Mobility Hubs and EV charging (e.g. P3, long term contracts, developer contributions, Lulu Island Energy Company) - Network of counters for tracking active transportation trips - Strategies for ensuring ease of integration of autonomous vehicles in Mobility Hubs - Collaboration with industry stakeholders to determine implementation priorities
	2	Design	Undertake design of short term actions. Develop guidance for context-sensitive design of each mobility hub typology.

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	2.1	Preliminary Design	Starting with short term planning priority actions staff will undertake: • **Policies:** Engage critical community stakeholders and service providers to gain feedback on the scope of the Sustainable Mobility Strategy • **Programs:** Accelerate EV charging installations and assess programs for existing residential buildings including assessing City-led advisory and/or installation services for at home charging equipment. • **Infrastructure:** Increase EV public charging installations (including DC fast charging stations) that support civic facilities and mobility hubs (e.g., including e-bikes, commercial buses, etc.) Develop OCP targets that directs land use policies to be supportive of sustainable transit services/infrastructure, including: • % of households within 400 m (a 5 minute walk) of rapid transit % of households within 800 m (a 10 minute walk) of rapid transit) • Targets/goals (eg. Population and or jobs within a five minute walk of a mobility hub) • Identify planning components to be provided at mobility hub guided by its typology (e.g., required, recommended, optional) Develop guidance for context-sensitive design of each mobility hub typology (e.g., specifications, standards, layout and siting considerations, CPTED) Determine and secure required funding (capital and operating) for two locations or work with development proponents to deliver the same
	2.2	Detailed Design	Bring forward reports for new policies and guidelines. Staff will engage stakeholders convened through the development of the Sustainable Mobility Strategy to advise on priority next investments.

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	3	**Implementation**	
	3.1	Implementation Planning	Directed by the internal Sustainable Mobility Working Group • Determine priority locations for mobility hubs and counters based on current conditions • Determine and design the approach at each location (e.g., City project, partnership with other agency, development requirement) • Determine phasing and timeline • Reporting, monitoring and measuring success On an annual basis, staff will bring forward capital funding requests or new Mobility Hubs acquired through private development rezonings.
	3.2	Implementation	Construction of pilot/demonstration mobility hub and roll-out of communications and pedestrian-bicycle counter network to connect mobility hubs The next year's planned investments will be moved forward through capital requests for Council consideration
	4	**Close-Out**	
	4.1	Close-Out	Develop implementation and operations monitoring program
Post Execution Approach	The internal Sustainable Mobility Working Group will ensure that programs are executed within line departments so as to ensure delivery and maintenance are completed by the most appropriate group.		

4.0 Schedule

Project Schedule	*See attached.*
Schedule Dependencies	*List major schedule dependencies (other projects, permits, approvals, long-lead items), and key activities on the critical path. List any key schedule assumptions.*

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Key Deliverables and Milestones

List the project's major milestones, deliverables, and the target date for completion. This list should reflect significant milestones (e.g. start, stage, approvals (or gates), procurements, decision points, completion) and overall tangible project deliverables.

- Dependent on creating a strong partnership and collaboration with industry stakeholders (residents, business associations, BC Hydro, TransLink, etc)
- Dependent on Provincial changes to the Strata Act, allowing greater opportunity for existing multi-family residences to install EV charging infrastructure.
- Dependent on BC Hydro and support infrastructure being in place
- Dependent on local interest in installing EV charging infrastructure at existing residences
- Dependent on continued reduction in EV cost and government incentives
- Longest timeline will be for the implementation component of this project, expected to take place over a 3 year timeline

Item	Deliverable / Milestones	Responsibility	Dates
1.	Establish Sustainable Mobility Working Group (internal) and establish informal external advisory group	City	Q2 2019
2.	Finalize scope of Sustainable Mobility Strategy; secure funding and procure consultant services	EV infrastructure working groups (internal)	Q2 2019-Q2 2020
3.	Complete policy and program priority actions	City	Q2 2020-Q2 2021
4.	Expanded City-owned charging infrastructure and Mobility Hubs	City / Partners	Q2 2021-Q4 2024
5.	Develop and maintain program reporting (as developed through the Sustainable Mobility Strategy)	City / Partners	Q3 2022-Q4 2024

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5.0 Financials

Project Budget	*See attached budget table.* *Comprehensive project budget with a detailed breakdown of projected revenues, if any, and expenses by year, source, and cost type (including identification of hard and soft as well as direct and indirect costs) that is reasonable, sufficient, and in line with the performance measurement plan. Identify methods, sources, and assumptions that result in class B (substantive) estimates at a minimum.* *Identify the major components of the budget such as hardware, external goods and services.* *Identify the department responsible for funding and any contributions (financial or in-kind) from other sources, and approach to leverage revenues, if any. Identify how the Smart City prize money will amplify the impact and reach of projects.* *This will be supported by Financial Analysis activities conducted at the Project Office level.*

6.0 Procurement

- Scoping: Procure consultants to assess infrastructure for the mobility hub (i.e., EV charging equipment, secure bike parking, transit shelters, signage)
- Strategy: RFQ/RFP or via existing agreements (e.g., street furniture contract)
- Schedule: during implementation planning phase (Winter 2019-Spring 2020)
- Commercial Criteria: signage/advertising, electrical costs

7.0 Stakeholders and Communications Plan

Key Project Stakeholders *A project stakeholder is any person, group or organization that is involved in, may exert influence over, or is affected by the implementation or completion of the project. Identify the stakeholders (internal and external) whose interests and influence must be*	**Stakeholder Group**	**Key Interest & Issues**	**Communication Method**	**Frequency**	**Comments**
	TransLink	Electrification of bus fleet	Email/meeting	As needed	
	BC Hydro	Electrification of vehicles	Email/meeting	As needed	
	Car-Share Operator	Provision of services as Mobility HUB	Email	As needed	
	Bike-Share Operator	Provision of services as Mobility HUB	Email	As needed	
	EV Charging Supplier	Provision of equipment	Email	As needed	
	EV Vendors	Expansion of EV ownership	Email	As needed	
	Pedestrian and Bicycle Counter	Provision of equipment to	Email	As needed	

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considered throughout the project; summarize their interests, expectations and any potential issues or concerns. For each stakeholder group identified, consider when communication is needed, the frequency of communication, and the method/format of communication.	Vendors	track active transportation trips			
	Ride-Hailing Services	Provision of services as Mobility HUB	Email	As needed	
	Taxicab Operators	Provision of services as Mobility HUB	Email	As needed	
	Strata Councils	Expansion of EV charging equipment	Email/meeting	As needed	
	Transit Shelter Suppliers	Provision of services as Mobility HUB	Email	As needed	
	Richmond Centre for Disability	Accessibility of mobility options	Email/meeting	As needed	
Approach	*Detail approach to engaging with, gaining acceptance from, and onboarding residents and other stakeholders for projects that ensures ongoing alignment between the outcomes and their concerns and needs. Include strategies that promote community involvement and transparency and tailor to diverse stakeholders and projects* *This is supported by Project Office level engagement strategy.*				
Anticipated Response	*Experienced or expected reactions from residents and other stakeholders and approaches for managing potential issues.*				
Diversity and Inclusion Considerations	*Identify any potential diversity and inclusion issue within the context of the project.* *Does research and/or consultation suggest that the project potentially affects diverse groups of people in different ways?* *Does the project create barriers for some groups of people?* *What response to the issue is being suggested within the context of the project?*				

8.0 Technology

Technology used *Provide details about the technologies used in your projects, including relevant applications elsewhere and results of testing and/or piloting in finalist phase* *Align the approach*	• Level 2 and Level 3 personal EV charging infrastructure • Dynamic parking network management systems • Electrical load sharing management system • Improved grid and electrical infrastructure capacity in select locations • Heavy duty electric vehicle charging infrastructure • Inductive loops and infrared technology to count cyclists and pedestrians respectively

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<table>
<tr><td>to the achievement of outcomes, feasibility, interoperability, replicability, and scalability of these types of projects.</td><td colspan="2"></td></tr>
<tr><td rowspan="11">Strategic Alignment</td><td colspan="2">Describe how the technology aligns to the achievement of outcomes, feasibility, interoperability, replicability and scalability of the project.</td></tr>
<tr><td>Technology</td><td>Alignment</td></tr>
<tr><td>Level 2 and Level 3 EV charging infrastructure</td><td>Provide the infrastructure and the access required to help the transition to electric vehicles</td></tr>
<tr><td>Dynamic parking network management systems</td><td>Allows organizations to track, report and manage their EV infrastructure and use, improve usability of the system for residents and users, as well as determine the overall impact of the system.</td></tr>
<tr><td>Electrical load sharing management system</td><td>Allows organizations and locations to install EV charging stations without needing to greatly increase the electrical demand and related infrastructure improvement costs required</td></tr>
<tr><td>Heavy duty electric vehicle charging infrastructure</td><td>Allows for non-personal vehicles to transition to electric use by providing access and infrastructure</td></tr>
<tr><td>Communications network to connect mobility hubs on app-based platform</td><td>• Access to a range of mobility options during an emergency/disaster post-disaster situation enables residents to access safe sustainable mobility options
• Access to a range of mobility seamless options for day to day transportation needs in support of City GHG/active living/equity goals
• Access to information systems (proprietary or integrated) that connect residents/businesses with sustainable mobility options</td></tr>
<tr><td>Inductive loops and infrared technology</td><td>Reliable means to automatically count and classify user type by direction</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td>Future-Proofing</td><td colspan="2">Approach to future-proofing the technologies (i.e. safeguards against vendor-generated proprietary constraints and obsolescence, workforce that is able to implement and operate the technologies and systems going forward)</td></tr>
<tr><td>Standards</td><td colspan="2">Adoption or development of standards, architectures, certifications, initiatives, and guidelines, including how these will enable: interoperability between the technologies, other technologies, existing community systems and services, and infrastructure replicability and</td></tr>
</table>

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	scalability
Accessibility	*Describe accessibility and usability of the technologies to diverse users, residents, and other stakeholders that support their uptake and acceptance.* *Demonstrate how other communities across Canada will benefit from your smart cities approach to the greatest extent possible.*

9.0 Data & Privacy

Preliminary Privacy Impact Assessment	*Supported by Project Office - Preliminary Privacy Impact Assessment.* *Description of personal information to be collected, used or disclosed. Description of who you will collect personal information from and approach to assessing that person's authority to disclose the information.* *Evidence that relevant privacy authorities were consulted and their guidance was considered in its development*
Governance	*Types and methods of data collection, generation, analysis, storage, and transmission, and plans for re-use, re-distribution, derivative production, archiving, and preservation that reflects the entire data lifecycle in project design*
Legislation and Regulatory	*How the technologies comply with relevant legislative and regulatory requirements*
Open Data	*Open and big data strategies, including the ways in which they facilitate transferability and replicability of technologies and projects.*
Ownership and Control	*Strategies for the avoidance of private-sector ownership and control of publicly-sourced data and community-owned and controlled data approaches*
Consent	*Strategies for meaningful consent in data collection, use, and disclosure.*
Data Minimization and de-identification	*Pursuit of less privacy-invasive alternatives wherever possible and de-identification of all personal information at the earliest opportunity and mitigation of potential for re-identification.*
Accessibility	*Accessible, interoperable, and open data approaches to drive community-based solutions*
Security	*Approach to the secure storage and transmission of data and assurance of effective cybersecurity*

10.0 Assumptions, Constraints and Risks

Assumptions *Reflect on all aspects of the project (i.e. scope, stakeholders, project team, steering committees, related projects, etc.) and list any conditions, circumstances or events assumed in the*	• Future capital requests are not approved • TransLink and Coast Mountain Bus will move forward with its plan to electrify all transit buses by 2050, beginning in 2023. • Provincial government continues with its plan of requiring all new light-duty cars and trucks to be zero emission vehicles by 2040. • BC Hydro will support the required increase in electrical

project.	infrastructure to improve EV service for residents and commercial operations.	
Key Issues and Constraints *List any known constraints and/or limitations within which the project must be conducted successfully. Constraints are factors that limit and place conditions on the project. Areas of constraint could include: budget, resource availability, technology, timelines, etc.*	• Future capital requests are not approved; this will delay or extend implementation. • City of Richmond will need to work collaboratively TransLink and Coast Mountain Bus to determine how it can help accelerate the development full electric buses in the City. • Still to be defined further Provincial grants and incentives to residents and commercial operation for EV vehicles and/or related infrastructure could help the City promote and accelerate use and ownership. • Large scale multi-family residential, commercial, and transit EV charging infrastructure will require power management system to regulate the demand and ensure continuous functionality of the systems.	
Risks and Risk Management *In the table below, identify any known risks (elements and/or barriers) that may have an impact on the success of the project and appropriate mitigation strategies.* *This section is to include a succinct assessment of each risk in terms of probability/likelihood, impact and strategies for dealing with the identified risk. Where there may be implications for and/or the need to include legal, this should be flagged.* *Identify risks by type: T: Technological, E: Environmental, C: Commercial, P: Political, S: Social, L: Legal.*	**Risks**	**Mitigation**
	• Capital requests not approved	• Seek alternative funding from Sr government and/or private sector (e.g. sponsorship)
	• TransLink plans are altered or changed	• Risk type= P or T • Likelihood = Low to moderate • Mitigation strategy = Work with other partners to determine how the City can support the switch to electric vehicles for bus operations in the City.
	• Provincial government EV targets are altered or reduced	• Risk type= P or T • Likelihood = Low to moderate • Mitigation strategy = Determine ways in which the City can support and encourage the increase in EV ownership and use on its own.
	• BC Hydro has technical and logistical challenges with the required electrical infrastructure improvements	• Risk type= T • Likelihood = moderate • Mitigation strategy = Determine ways in which the City can support and encourage the increase in EV ownership and use on its own.

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	• Needed support funding for required infrastructure upgrades and improvements does not materialize	• Risk type= P • Likelihood = moderate • Mitigation strategy = Work on finding other sources of funding to support the needed upgrades and improvements
Critical Success Factors *Reflecting on the identified project goals, objectives and deliverables describe the success factors the will contribute to the completion of the project and specifics about how the goals were met. These should be measurable and quantifiable.*	• Increase ownership and use of EVs in the City of Richmond by residents and visitors through support programs and information sharing – 50% increase in the next 5 years • Help to accelerate the electrification of transit buses in the City – enable infrastructure to achieve 100% conversion by 2040 as identified in TransLink's long term vision	

11.0 Reviews and Document Control

Change Management	*Describe the strategy to address and approve revisions and changes to the Project Charter. This may include identifying processes for changes that are considered minor in scope (no financial, or schedule impacts) or more major in scope (financial, schedule, and/or organizational impacts).*			
Revision History	*In this section, identify document changes to the Project Charter.* *If documenting the development of the Project Charter, the numbering of drafts should start at 0.1. The approved and signed off version would be 1.0 therefore any revisions undertaken after the signed version should begin at 1.1.*			
	Date	**Author**	**Version**	**Change Description**

Project Implementation Plan Approval: The undersigned acknowledge they have reviewed and approved the project charter. *Add additional approvers as required. Approvers may include internal as well as external stakeholders.*

Engineering	Milton Chan, Team Lead, Smart Streets and Sustainable Transportation	
	Signature	*Date*

6056353

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Division/Organization	Enter Name & Title Here Signature	Date
Division/Organization	Enter Name & Title Here Signature	Date

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Project Budget Table

To be provided in separate excel file.

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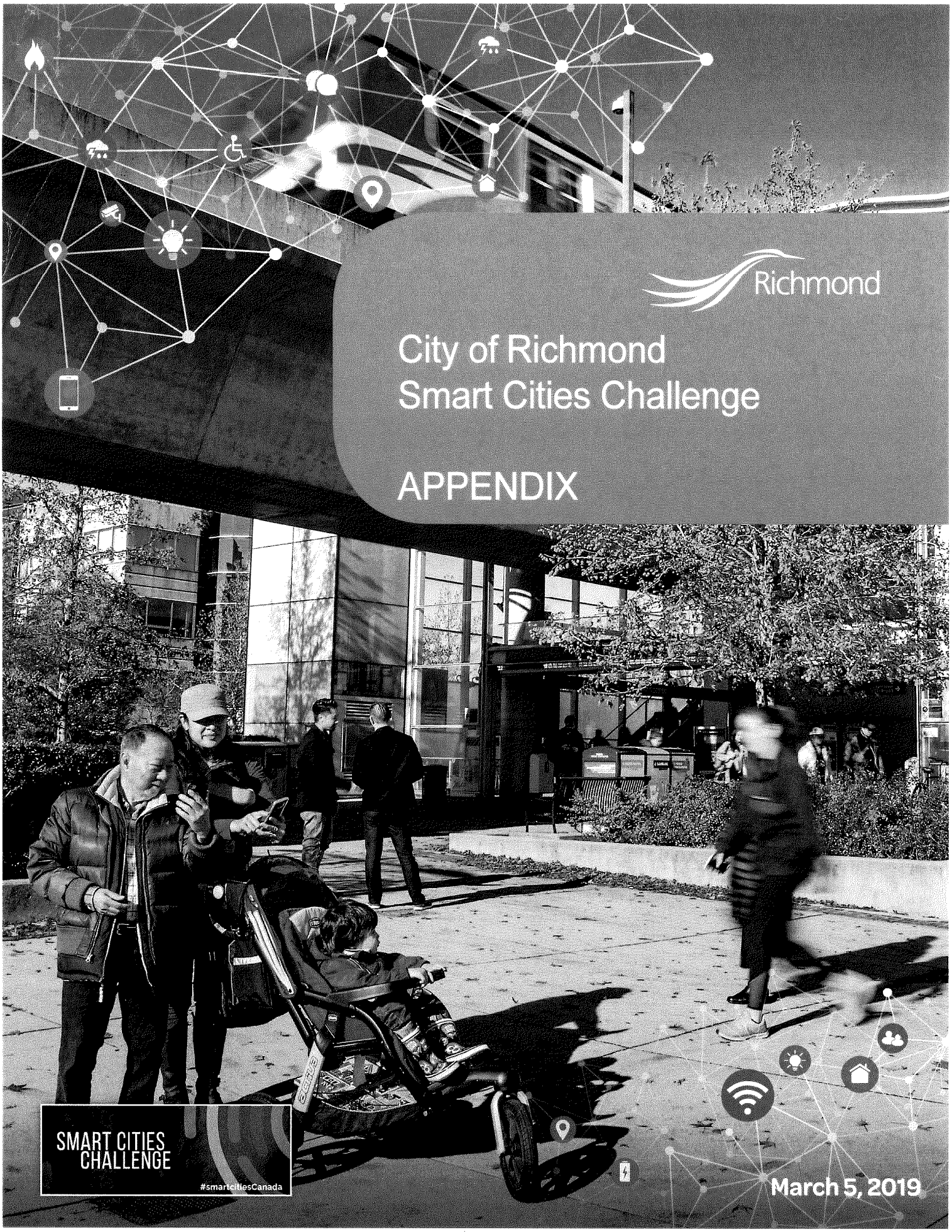
Project Risk and Mitigation Table

Include a succinct assessment of each risk in terms of probability/likelihood, impact and strategies for dealing with the identified risk. Where there may be implications for and/or the need to include legal, this should be flagged. Identify risks by type: T: Technological, E: Environmental, C: Commercial, P: Political, S: Social, L: Legal.

Item	Risk Type	Risk	Likelihood of Occurrence (H/M/L) H: Almost Certain M: Possible L: Rare	Impact to Project if Occurs (H/M/L) H: Major M: Moderate L: Insignificant	Mitigation Strategy	Legal implications
1.						
2.						
3.						
4.						
5.						
6.						
7.						



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Appendices

Appendix 1

- Appendix 1.1 – Disaster Case Study Major Bog Fire
- Appendix 1.2 – Clean Trucking Initiative – Vancouver Fraser Port Authority and TransLink
- Appendix 1.3 – MDA Commitment Letter of Understanding – Innovative Superclusters Initiative
- Appendix 1.4 – Letters of Support

Appendix 2

- Appendix 2.1 – Our Projects
- Appendix 2.2 – Design Proposal Physical Operations Hub
- Appendix 2.3 – Lightship Field Operations Platform
- Appendix 2.4 – Map and Listing of New and Existing Sensors

Appendix 3

- Appendix 3.1 – Project Implementation Plan Template
- Appendix 3.2 – Risk Log Template
- Appendix 3.3 – Anticipated Procurement Opportunities
- Appendix 3.4 – Request For Expression of Interest (RFEOI)

Appendix 5

- Appendix 5.1 – Emergency Management Plan
- Appendix 5.2 – Issues Log Template
- Appendix 5.3 – Aligned Advisor/Partner Projects
- Appendix 5.4 – TELUS PureFibre Project

Appendix 6

- Appendix 6.1 – Engagement Plan
- Appendix 6.2 – Samples of Communication Materials

Appendix 8

- Appendix 8.1 – Financial Summary of Projects – Five Year Plan
- Appendix 8.2 – Comprehensive Cost Details and Assumptions
- Appendix 8.3 – Projects that may Qualify for Additional Senior Government Funding Programs

Appendix 9

- Appendix 9.1 – Climate Lens: GHG Change Resilience Assessment

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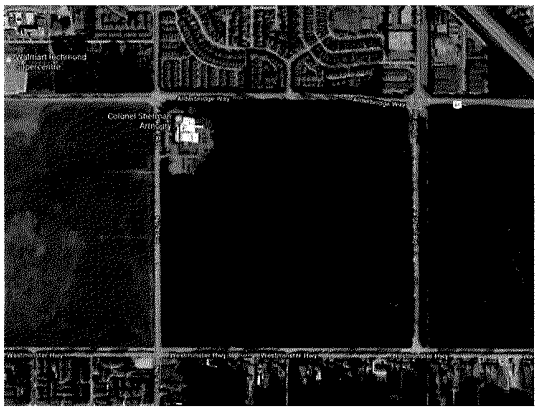
Disaster Case Study

Major Bog Fire on Department of National Defence Lands

On July 27, 2018 there was a major bog fire within the City of Richmond's boundaries. While the fire took place geographically in the City, the incident happened on land owned by the federal government; thereby, increasing the level of complexity in terms of communication, governance, safety, and emergency response. The fire took ~four days to fully extinguish. Below are details on the incident, and an example of how the City's Smart City solution could help increase response times, reduce economic loss, reduce environmental impact, and improve the overall well-being of residents.

Details:

Event:	Wild Land Fire 2018
Event start date:	July 27, 2018
Event start time:	0605 hrs
EOC activation date/time:	July 27, 2018 1000 hrs
EOC deactivation date/time:	July 30, 2018 2100 hrs
Event end date:	August 9, 2018
Event end time:	0600 hrs
Event address:	49.174176, -123.105610
Hot Zone:	South of Alderbridge Way, East of No 4 Rd, North of Westminster Hwy, West of Shell Rd



Responders: Richmond Fire Rescue Department
Engineering and Public Works Division
Environmental and Sustainability Department
Richmond RCMP
Department of Defence
BC Wild Fire

Stakeholders: Airport Authority
CN Rail
Ministry of Transportation
Emergency Management BC
Ministry of Environment & Climate Change Strategy
Richmond Commerce
School District 38

Richmond

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Situation Summary:

27 JULY

- City was notified at 0605hrs on July 27, 2018 about smoke coming from the field, located at/near the Richmond Nature Park.
- RFR responded.
- At 1000hrs the EOC was activated as the location was identified as DND property.
- As a result of the risk of a full field fire, possible hwy jump to a residential, commercial and protected nature park, fire suppression by air was requested. Arrived at 1120hrs
- BC WildFire Service crews requested and provided support from 1415hrs. Excavators and bulldozers along with additional resources requested.
- Corporate Communications providing social media updates through the afternoon
- Fuel, food, and water requested and provided through EOC via RFR doc paper requests.
- BC WildFire arranged for 20 addl firefighters to arrive 28 July
- Corporate Comms provided press release in late evening 27 July.
- YVR notified and coordinated with to coordinate potential air service impacts.
- RFR contacting Port Moody fire service for specialized suppression equipment.
- 2 ATVs delivered through Public Works via EOC paper request for use through the evening of 27 July.
- Meals delivered and served at 39 Btn

Situation Reports:	Distributed: Date/Time
Sit Rep #001	2018-07-27 1200 hrs
Sit Rep #002	2018-07-27 1500 hrs
Sit Rep #003	2018-07-27 1800 hrs
Sit Rep #004	2018-07-27 2100 hrs
Sit Rep #005	2018-07-28 0900 hrs
Sit Rep #006	2018-07-28 1630 hrs
Sit Rep #007	2018-07-29 0900 hrs
Sit Rep #008	2018-07-29 1400 hrs
Sit Rep #009	2018-07-29 2100 hrs
Sit Rep #010	2018-07-30 0900 hrs
Sit Rep #011	2018-07-30 2100 hrs
Sit Rep #012	2018-07-31 0900 hrs
Sit Rep #013	2018-07-31 1600 hrs
Sit Rep #014	2018-07-31 2100 hrs

28 JULY

- Recurring hotspots managed through the evening and early morning.
- Delta WildFire crews on scene to assist with suppression.
- Heavy equipment returned (bulldozers, excavators, etc.) to assist
- WildFire PPE considered for RFR staff to provide additional protection
- Meals requested, ordered, and delivered through the day

6126925

29 JULY

- 360-degree perimeter completed with fire line using a forestry fire hose
- Fire 100% contained, 70-75% confidence by 0900hrs
- No flare-ups' overnight noticed
- Staffing reduced down to roughly 30, BC WildFire crews deployed to other fires in BC, no further DND staff available
- Fire 100% contained, 85% confidence by 2100hrs
- Water pumps setup for the long haul
- Multi-jurisdiction staffing still in rotation for suppression & support
- Ongoing communications to the public to avoid the area
- Meals requested, ordered, and delivered through the day

30 JULY

- Crews maintaining 50' containment ring around the fire while working to maintain firebreak & work through action items
- Weather station setup to monitor changing conditions
- Meals requested, ordered, and delivered through the day

31 JULY

- Fire 100% contained, 90% confidence by 0900hrs
- Patrols regularly conducted through the evening and morning for monitoring
- Alternate water-main sources completed by Public Works crews providing for constant supply through city mains. Gas generators and pumps no longer in use.
- Significant weather changes impacted suppression efforts, but containment was maintained.
- Media interviews conducted by RFR & Corporate Communications
- Social media updates ongoing
- RFR DOC and EOC demobilized as a result of containment and suppression efforts reaching a state of confidence.
- Crews are monitoring overnight.

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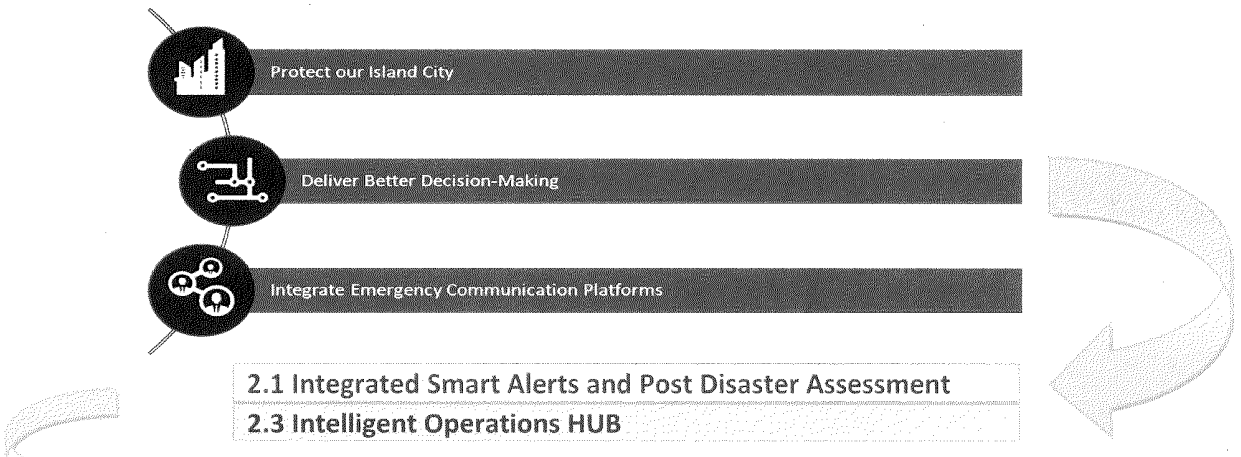
Recommendations for Integrated Operations Centre:



Recommendation	Benefit	Operations
Live GIS mapping	Unified situational awareness	Transportation maps can be updated. Corporate Communications could create real-time messaging. Materials and Responder Resources can be anticipated from real-time trends/pattern. Tactical decisions can be made from a number of data sources, drone, weather, plume, environmental considerations and commerce.
Integrated update system	Synchronized updates and single-source-of-truth	Reporting to Province, Stakeholders and Partners are real-time accessible.
Automated updates	Time and error saving facilitating effective communication internally and externally	
Automated request forms	Time and error saving, cost recovery	From Incident Command to EOC in a click of a button, approval and procurement in the second click of a button Partners are able to see the request and provide solutions for time and cost effective ordering
Physically centralized operations	Expedient request fulfillment and effective communications	Operations staff in one room allows for network conversations and advance planning to take place from an objective perspective.
Standardized, scheduled, conference calls	Operations and priority alignment	Reduces time operations staff spend in collecting data from a number of response agencies to collate a summarize.
Public communications dashboard	Expedited/increased information flow and situational awareness	Build confidence in the public that response is taking place, and provide information relevant to their wellbeing or interest.
Unified communications (same frequencies and tools)	Facilitate effective responder communications	Communication redundancy on every level to ensure failures are anticipated and resolved. Transportation can notify public works using traffic cams, that road diversion is required.
Integrated geographic resource tracking (through GIS)	Single-source-of-truth for all involved assets allowing for improved situational awareness and decision making	Recovery from an environmental and health aspect.
Centralized reporting number for all issues	Facilitate effective and early alerting of issues	
Centrally accessible camera system	Situational awareness	
Digital alternative for reporting of all issues	Facilitate effective and early alerting of issues	

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PORT of vancouver

Proposed Clean Trucking Initiative

White paper, December 2018

The Vancouver Fraser Port Authority, in collaboration with the Province of British Columbia and TransLink, is proposing a new initiative to explore alternative fuel source container trucks with the participation of the container trucking community.

The program will explore and trial new technologies, and the accompanying infrastructure, to support the evolution of the industry and the future of the gateway.

BRITISH COLUMBIA

TRANSLINK

2019 pilot program

The port authority, the province, and TransLink are planning to launch a pilot program, with the support of energy suppliers, infrastructure providers, vehicle manufacturers, vehicle dealers, container trucking companies, and drivers, to explore the use of alternative energy vehicles in Vancouver's container trucking industry.

The pilot program is being driven by the growing success of alternative energy vehicles for both personal and commercial use. During the pilot, companies and drivers will have the opportunity to trial alternative energy sources and vehicles, including Class 8 on-road trucks and yard trucks. The goals are to ensure successful trials of low-emission and alternative energy vehicles, increase awareness of viable options, and provide a positive experience for drivers using alternative energy sources. Feedback during the pilot will promote proactive thinking about future infrastructure requirements needed for the trucking industry's continued growth.

Alternative fuel sources

- Natural Gas (CNG/LNG)
- Hybrids
- Propane
- Electric Battery
- Renewable Diesel (HDRD)
- Electric Hydrogen Fuel Cell

Port of Vancouver clean fuel programs

- Shore power allows cruise and container ships to use electricity at port
- EcoAction offers discounted harbour dues for ships using clean technologies and low-sulphur fuels
- Non-Road Diesel Emissions Program offers incentives to terminals that upgrade old equipment to cleaner models
- Climate Smart Program helps port tenants measure and reduce greenhouse gases

Learn more at **portvancouver.com/environment**

Province's CleanBC Plan

- Creating a new heavy-duty vehicle incentive program
- Expanding the Clean Energy Vehicle Medium/Heavy-Duty program to support transition to zero-emission vehicles and fuels

Learn more at **cleanbc.gov.bc.ca**

TransLink Regional Goods Movement Strategy & Environmental Sustainability Targets

- Exploring ways to accelerate uptake of low- and zero-emission Heavy Commercial Vehicles
- Support for optimizing container drayage at the Port of Vancouver
- 80% reduction of GHG emissions and 100% renewable energy use across TransLink's entire fleet by 2050

Learn more at **TransLink.ca**

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Vehicle technology pilot programs at other ports

Ports of Los Angeles, Long Beach and Oakland, California, USA

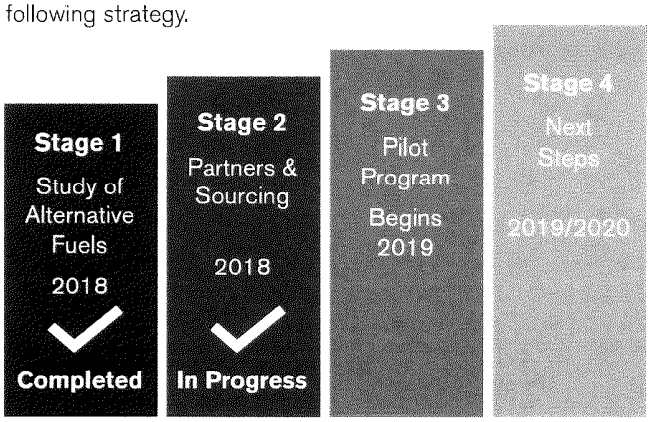
- **Hydrogen fuel cell:** Toyota began testing a truck with a 200-mile range on a 20-minute charge in 2017. A 300-mile-range truck is being tested in 2018.
- **Electric battery:** BYD began testing a truck with a 100-mile range in 2018.
- **Natural Gas:** TTSI is operating natural gas drayage trucks.

The Port Authority of New York & New Jersey, USA

- **Green fleet:** Since 2016, more than 80% of the on-road fleet has been transitioned to alternative fuels, including over 350 heavy duty trucks.
- **Electric battery:** In 2017, the port authority began testing BYD battery electric Class 8 yard trucks.

Clean trucking program strategy

The pilot program is proposed to launch in 2019 as per the following strategy.



Study of alternative fuels

A study has been completed to determine the viability of alternative fuel sources and vehicles within the Vancouver gateway.

Partners and sourcing

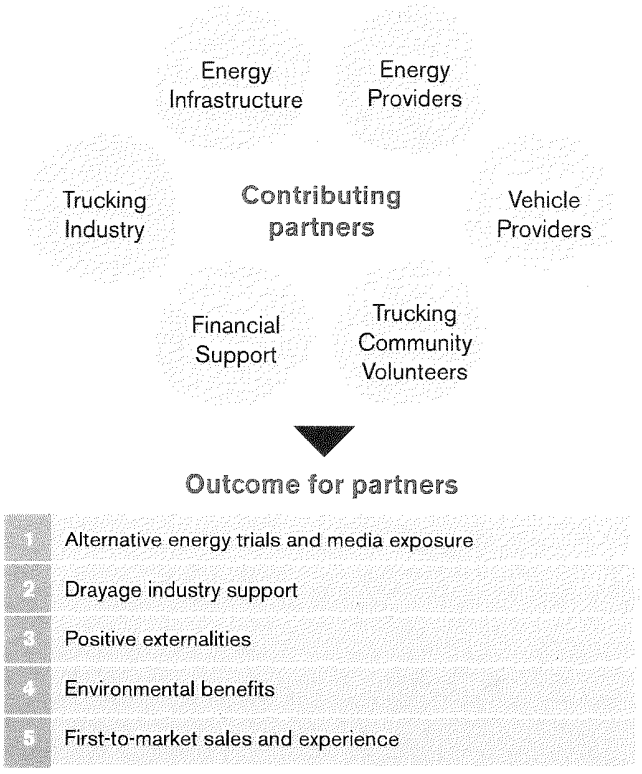
The port authority is seeking support from partners and energy suppliers to provide trucks and sources of alternative energy for the pilot program.

Pilot program, feedback and next steps

The pilot program will provide critical feedback from owner-operators and trucking companies about the different trucks and fuel sources tested during the program. This feedback will directly influence potential policy development, incentives and future infrastructure planning.

Opportunities for support

In order to carry out the pilot program, the port authority is looking for support from the following contributing partners.



Contact:
For more information, email: **cleantrucking@portvancouver.com**

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March 5th, 2019

Denise A. Tambellini
Manager Intergovernmental Relations and Protocol Unit
City of Richmond

Dear Denise,

Re: Smart City and Canada Digital Supercluster

MDA is launching a new Smart City service offering focused initially on early flood detection and alert and post disaster recovery, using big data from sensors and satellite imagery and predictive analytics and machine learning technologies.

MDA wishes to team with the City of Richmond as our launch customer for our Smart City offering and our Smart3D APS data commons platform, which we intend to market across Canada and Internationally.

As you are aware, MDA is a Gold sponsor for the Canada Digital Supercluster (CDSC) Program. Further to this, MDA intends to submit a response to a call for proposals to be issued by CDSC later this month. The goal of our proposal under this program will be to secure funding to support the development of our Smart City platform (Smart3d APS) and to support the City of Richmond's objectives under your Smart City initiative.

This letter is to confirm that MDA intends to include the City of Richmond as a strategic partner in our proposal to CDSC, together with other select partners.

We understand that the City of Richmond intends to provide funding in the order of $500,000 and in-kind support for our proposal to CDSC. In return, MDA will ensure that the City of Richmond Smart City objectives and desired outcomes set out in Appendix "A" below are reflected in our proposal for CDSC funding, and that the City receives significant value for its contribution should our proposal be accepted.

MDA also confirms our intent to work with the City and your various stakeholders to align activities, learnings and outcomes where possible, to mutual benefit.

I look forward to working with the City of Richmond on these exciting initiatives.

Yours truly,

[redacted]

Terry Tarle
Senior Director,
Enterprise Geospatial Solutions
MDA System Ltd

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MDA

Appendix "A"

City of Richmond CDSC PoC Desired Outcomes

Outcome 2: Collect and Analyze Information for More Informed Decision-Making

Information from internal and external sources will be collected, analyzed and shared for staff and the community to make more informed and time-sensitive, operational decisions. Data will be analyzed using machine learning based technology which will identify factors and patterns that introduce risk.

This knowledge will be used to support the implementation of integrated response plans which identify the resources and data required both internally and externally to address the identified risks. Key information will also ensure rapid assessment post-disaster to decrease loss of life and return to business as usual for the community. Examples are below:

Federal Innovation Superclusters Initiative - Proof of Concept

Richmond will be part of the team that will develop a proof of concepts (PoC) for the projects below. The team will use sensor information already being monitored through the City's Engineering and Public Works division, Ocean Networks Canada, the Ministry of Transportation and Infrastructure and others. New sensors will be added as needed. The project team will be led by MDA, a Richmond based aerospace technology company.

The following four scenarios will make up the first test cases:

1. **Early detection and mitigation of flooding:**

   This includes using and analyzing various data sources such as the measurements from drainage pump stations and box culverts, plus information such as water levels on the river, and weather and tide data to indicate high risk times for the city. An integrated emergency response plan developed in collaboration with key agencies on the island will identify the resources and data required both internally and from our partners to make the best, most efficient and well-informed decisions. (See Test Case in Chapter 2). Rainfall sensor information will be used in analysis and drones will be used for dike inspection. This data can be used to improve ongoing maintenance programs and help identify priority locations for capital infrastructure improvements that will better cope with the more intense and frequent storms that are expected to occur due to climate change.

2. **Early warning for earthquakes and post disaster assessment:**

   The Ministry of Transportation and Infrastructure has seismic sensors in Richmond that monitor potential ground and building movement. Pre-existing sensors are also secured on all provincial bridges and tunnels. Ocean Networks Canada has early warning earthquake sensors on the east side of Vancouver Island that are already connected to the Canada Line and monitored by TransLink. Richmond will integrate this information and be the first Canadian municipal government to connect to the early warning system through the Intelligent Operations Hub. Emergency Management BC and Kwantlen Polytechnic University will test sensors for post disaster assessment and occupancy after a quake that is over 5.0 magnitude. All these sensors will be networked to create better information to improve predictability and implications of seismic events and give the community up to 90 seconds in preparation time for a major earthquake. Part of this test case will be to indicate through water pressure sensors, how to decrease leakage from pipes as well as indicate where water is available with suitable pressure to fight fires. This project will be supported by Emergency Management BC.

3. **Early detection and mitigation of spills in the riparian zone (i.e. jet fuel):**

   Sensors placed in and around key risk areas such as at the Port of Vancouver docks and YVR and other high traffic waterways, will identify potential fuel leakage or toxic spills and communicate that

.../ 2

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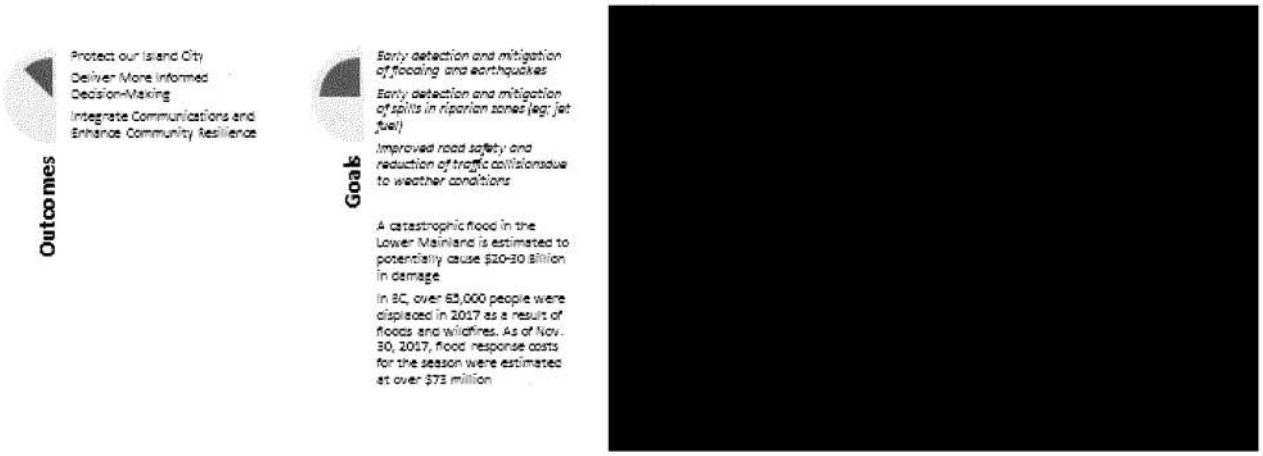
information to the Intelligent Operations Hub. Preprogrammed drones will be sent out to inspect possible leaks or spills and if confirmed, an integrated response plan will be enacted with predetermined shared information/ data identified and clear operational responsibilities established between partners. Satellite images will be used to track spills, similar to work conducted in the Gulf of Mexico, to decrease risk to habitat and protect water resources. This project will be supported by Vancouver Fraser Port Authority, and Transport Canada.

4. **Improved road safety and reduction of traffic crashes due to weather conditions:** Richmond has sensors that measure traffic volumes, monitor temperature and moisture of the roads. Working with the Ministry of Transportation and Infrastructure, additional sensors will be implemented which will provide enhanced traffic volume data including speed and direction of travel. At least three-quarters of crashes occur during rainfall events and work has been conducted to identify other patterns including the most common times and days of incidents. Analysis will be conducted to introduce variable speed on roadways based on road conditions at high risk intersections and highways.

The following chart is an example of our outcomes-based approached leading to a private sector test case listed above under the Smart City Challenge:



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February 28, 2019

George Duncan
Chief Administrative Officer
City of Richmond

Dear Mr. Duncan,

Vancouver International Airport (YVR) is one of North America's major transportation hubs, creating jobs and driving innovation across the region. As Canada's second-busiest airport, YVR facilitated over 25.9 million passengers, 338,000 tonnes of cargo and $16.8 billion of economic output in 2018. And as the Skytrax recipient for Best Airport in North America—for a record nine years in a row—the airport is well-known for its focus on providing an exceptional experience for passengers, partners and communities.

As a community-based organization, YVR is committed to working closely with its neighbours. The airport is located on Sea Island, within the City of Richmond, and as such works with the City on a daily basis. There are few aspects that are not directly impacted by our close working relationship—from regular operations to policing, traffic and incident response. Both YVR and the City of Richmond are committed to safety and teamwork, which we demonstrate through our shared vision: to provide the best possible service and experience to our customers.

YVR fully supports the City of Richmond Smart Cities bid.

Sincerely,

Anne Murray
Vice President, Airline Business Development and Government Affairs

P.O. BOX 44638
YVR DOMESTIC TERMINAL RPO
RICHMOND BC CANADA V7B 1W2
WWW.YVR.CA

TELEPHONE 604.276.6500
FACSMILE 604.276.6505

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PORT of vancouver

Vancouver Fraser Port Authority
100 The Pointe, 999 Canada Place
Vancouver, B.C. Canada V6C 3T4
portvancouver.com

February 21, 2019

City of Richmond
6911 No. 3 Road
Richmond, B.C. V6Y 2C1

RE: Support for the City of Richmond's Smart Cities Challenge

I am writing on behalf of the Vancouver Fraser Port Authority in support of the City of Richmond's submission to Infrastructure Canada for consideration of federal funding through the nation-wide Smart Cities Challenge.

The port authority is pleased to collaborate with the City of Richmond on this important and innovative initiative. This work represents a commitment from industry and partners from multiple agencies.

Richmond's proposed "Intelligent Operation Hub" would link existing and new data streams and asset management platforms from multiple agencies to effectively respond to incidents such as traffic congestion or a major earthquake. This initiative will enhance the day-to-day delivery of local services for residents, while also improving community resilience and response to major events, and protecting critical local and national infrastructure in Richmond.

Investing in smart city technology and infrastructure in Richmond is not just of local significance. Richmond is located at the centre of the Greater Vancouver Gateway for logistics, air travel and air cargo. Continuous efficient operation of the supply chain is therefore at a higher risk in Richmond, because as an island city located in the Fraser River estuary it is particularly vulnerable to a major impact. The Port of Vancouver has approximately 1,000 acres of land in Richmond, used largely to facilitate international trade and logistics that support our region's container terminals and finished automobile import terminals. In addition, nearly one million cruise passengers travel to Canada Place each year with many of those coming through the Vancouver International Airport in Richmond.

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Canada

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The Vancouver Fraser Port Authority is supportive of Richmond's pursuit of funding through the federal Smart Cities Challenge. We are pleased to be part of a challenge to improve the everyday lives of residents in one of our port communities.

If you wish to discuss this matter further, please do not hesitate to contact this office.

Yours truly,

Tom Corsie, PPM
Vice President, Real Estate

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URBAN LOGIQ

Building Better Communities with Data

March 1, 2019

Dear Smart Cities Challenge Selection Committee,

It is my honour to write in support of Richmond, British Columbia's submission for the Smart Cities Challenge. Richmond's vision for a smarter city promises a future that is more inclusive, sustainable and prosperous for its citizens, while laying the foundation to share and scale benefits across the country to all Canadians and offer exciting export opportunities to build better communities globally.

The Smart City Challenge team at Richmond has been a role model for bringing together disparate departments, the public and private sector, and multiple jurisdictions of government together with the cohesive mission to better the lives of their citizens. Citizens do not experience their community through jurisdictional boundaries, and the integrated community management system that Richmond is developing offers the kind of seamless provision of services to the community that allow for a holistic understanding of a community's needs, addressing the fragmented silos that cause citizens and issues to fall through the cracks. Moreover, in a world that is increasingly shrinking, Richmond's model of bringing together all stakeholders to add their unique talents and resources in a coordinated effort represents the future of civic leadership, and it has been an inspiring experience seeing how companies large and small, public servants and academics, community leaders and citizens were included in the process in a meaningful fashion while being continually refocused on how to drive real impacts in a methodical, sustainable and practical fashion.

When we started UrbanLogiq three years ago, our belief was that data science and technology such as artificial intelligence could be harnessed to build better communities for all citizens. As a fast growing Canadian company that has won numerous awards internationally and attracted Silicon Valley investment, we have had the honour of implementing our technology across the United States and Canada and are in the process of exporting to Europe, the Middle East and Asia. I can say with utmost confidence that the leadership and holistic thinking displayed by the City of Richmond has been second to none, and the integrated community management system will result in a safer community, more responsive services, a more efficient government, and better lives for all its citizens, while turning Richmond, British Columbia into a global showcase that will put Canada at the forefront of the global smart cities space.

Sincerely,

Mark Masongsong
CEO & Co-Founder
UrbanLogiq
mark@urbanlogiq.com

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TRANSOFT
SOLUTIONS

February 27th, 2019

As a global leader in the development of transportation engineering software, we are excited about the opportunity to be on the advisory committee for the City of Richmond's Smart Cities Challenge Submission.

Our company was founded in Richmond and our headquarters will be in this progressive city for the foreseeable future. In all aspects where Richmond benefits as a city, we see a direct translation into appreciable gains, not only to our business, but to our employees as well. Business continuity is very important to us and we believe that the proposed Smart Cities initiative will not only increase preparedness in dealing with disasters and emergencies, but also improve the quality of life for its citizens. The advanced technologies and its governance coming from this proposal has the potential of transferring to other municipalities and upscaling to a wider jurisdiction.

After attending several of the engaging technical sessions and advisory committee meetings, I was quite amazed at how well prepared the project team was. The advisory committee did an excellent job examining the various priorities, brainstorming different options and challenging the feasibility of the technologies. I truly believe in the practicality of the proposal and the direction its going.

This letter is to show our support behind the Smart Cities Challenge proposal. We wish the City of Richmond all the success in winning the challenge.

Sincerely,

Steven Cheng
Chief Operating Officer
Transoft Solutions, Inc

DESIGN WITH CONFIDENCE

Transoft Solutions Inc.
350-13700 International Place
Richmond, British Columbia
V6V 2X8 Canada

Phone 604 244 8387
Fax 604 244 1770
Toll Free 1 888 244 8387

transoftsolutions.com
info@transoftsolutions.com

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TransLink
400 - 287 Nelson's Court
New Westminster BC V3L 0E7
Canada
Tel 778.375.7500

www.translink.ca

South Coast British Columbia
Transportation Authority

February 27, 2019

To whom it may concern

Re: Support for City of Richmond BC Smart Cities Challenge

TransLink, officially recognized as the South Coast British Columbia Transportation Authority, plans and manages Metro Vancouver's transportation system as a strategic whole. We deliver these services through contractors and our operating companies who utilize bus, SkyTrain, rail and marine modes of transportation.

We are dedicated to creating and sustaining a transportation system that meets the needs of residents, businesses and goods movers in a manner that protects the environment and supports the economic and social objectives of the region.

The safety and security of our customers and employees is paramount. Our ability to deliver a safe and secure service partially depends on the information and communications we receive from our municipal partners.

TransLink is in support of the City of Richmond's application for the BC Smart Cities Challenge. The planned integrated city operations hub would bring together all of the city's daily operations teams to a single physical and virtual focal point. This would enable us to have a central location to obtain relevant and timely information on a daily basis and during emergency situations.

If you require more information, please contact me at 778.375.6975 or dorit.mason@translink.ca

Sincerely,

Dorit Mason
Senior Manager, Emergency Management & Safety

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TransLink
400 - 287 Nelson's Court
New Westminster, B.C.
V3L 0E7 Canada
Tel 778.375.7500
translink.ca

South Coast British Columbia
Transportation Authority

Smart Cities Challenge Judges,
Infrastructure Canada

To Whom it may concern,

TransLink supports Richmond's Smart Cities Challenge and their identified outcomes and their plan to achieve the following outcomes:

1. Protect Richmond's island and address the increasing impacts of climate change;
2. Deliver more informed decision making; and
3. Integrate Communication and Enhance community resilience.

We support the direction and believe that early detection and mitigation of flooding, earthquakes, spills on the Fraser and decrease in crashes on roadways will also help TransLink achieve our long-term objectives.

TransLink will continue to work toward enhancing sustainable mobility principles across the Lower Mainland. Our contribution to the Smart Cities Challenge will be working toward the following:

1. **Support of the Electrification of Buses and Trucks:** TransLink will focus on the mobility electrification across the Island. As part of the development of our low carbon fleet strategy, TransLink is determining electric charging options for the service area in Metro Vancouver. TransLink is collaborating with the City of Richmond to determine future requirements for electrification, including analyzing charging scenarios – either on route (bus loops, on street) or at bus depots. As partners in the Clean Trucking Initiative Pilot Program, we will also work with the Vancouver Fraser Port Authority and the Province on identifying potential charging station locations for trucks in the Metro Vancouver area, including Richmond.
2. **Data Sharing Agreement:** Data sharing agreements will be negotiated for information that broadens the awareness to make effective decisions.
3. **Bike Storage Facility:** TransLink will install bike storage lockers at the Canada Line Stations to supplement the locations already in Richmond. The public can find and book a free locker online.

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We have supported the initiative through our participation on the Advisory Committee and in the Partner Collaboration sessions and look forward to further collaboration.

Please let me know if you have questions.

Thank you,
Andrew McCurran

ANDREW McCURRAN, MCIP RPP
Director, Strategic Planning & Policy
Tel: 778-375-7643

TransLink
South Coast British Columbia
Transportation Authority
#400-287 Nelson's Court
New Westminster, BC
V3L 0E7 Canada

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TIBCO

March 4, 2019
To Whom It May Concern:

Letter of Support,
Re: City of Richmond's Smart Cities Challenge Proposal

TIBCO Software is pleased to announce our support for the City of Richmond's Smart Cities Challenge proposal. TIBCO has been working with the City for Richmond for over three years now in developing their integration platform, and we look forward to deepening that partnership with this next phase and into the future.

We believe strongly in the City of Richmond's vision of becoming a city enabled with physical and virtual platforms with seamless integration across all levels of government. This will allow Richmond to scale their solutions, innovate, and react to emergencies much more effectively and efficiently.

Our primary use case for the Smart Cities Challenge is to improve driver safety within the city of Richmond. We did this by funding a Proof of Concept which analyzed historical traffic data around the intersection of Steveston Highway and No 5 Road, where there were an extremely large number of annual traffic accidents. We then created statistical models to predict when an accident was likely to occur, and used real-time traffic data to alert the city. Our models were able to predict over 60% of the accidents that occurred with a 30-minute lead time.

We intend to take this same approach to many other capabilities throughout the city, whether we're analyzing water levels, traffic patterns, pedestrian foot traffic, or any other creative approach to improving the citizens' lives in Richmond.

Our Operations HUB Platform will bring tremendous value in terms of saving lives, increasing citizen safety and wellbeing, and enabling the city to interact on a more personal level with its 200,000 constituents. We see this as a massive step forward for Canadian cities, and are excited to share this success with other Canadian cities across the nation.

We will be supporting many aspects of City of Richmond's initiative, and would like to clearly outline where we see the best fit for our technology.

- We will provide a real-time Intelligent Operations HUB that will display, on dashboards, all of the data streams from across the city
- This HUB can use our advanced analytics and Machine Learning capabilities to both create and improve the statistical models needed to predict emergencies
- Integrate all necessary systems with the MyRichmond app
- Enhance MyRichmond app for mobile devices

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TIBCO

We have over 10,000 customers globally, including many implementations with similar capabilities spanning various verticals. In Canada alone, we work with all major banks, 5 major pension funds, airports and airlines, dozens of oil and gas companies, and various other crown and private corporations. All of these client relationships, combined with the strength of our partnership with the City of Richmond and the many successes we have achieved in building out this platform already, mean that we will be able to execute quickly and effectively moving forward.

We are proud of being a part of the City of Richmond's leading edge integration platform, and we are excited to continue our partnership in making Richmond a Smart City.

Sincerely,

Michael Johnson, Canadian Country Manager

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TELUS | Business

TELUS Communications Inc.
510 West Georgia Street
Vancouver, BC V6B 0M3

February 28, 2019

City of Richmond
6911 No 3 Rd
Richmond, BC V6Y 2C1

Subject: Smart Cities Challenge

Dear Smart City Challenge Jury,

On behalf of TELUS, we are writing to express our support for the City of Richmond in their Smart Cities Challenge proposal that aims to significantly better protect, integrate and transport its citizens.

As a member of the City of Richmond's Smart Cities Challenge advisory board member, we have observed the city take a very thoughtful and inclusive approach to develop its vision and solutions to address some of the city's most critical issues. We have also worked closely through the Smart Cities Agreement with the city to align on enabling the Smart Cities strategy with TELUS' PureFibre investment that will connect its residents, businesses and public infrastructure and bring the foundation for the upcoming 5G wireless. We expect that the city's unique data and technology-driven disaster mitigation projects to create effective systems and tools to keep its citizens safe. We believe these systems and tools have the potential to become a prototype for other municipalities to replicate.

We are confident that the City of Richmond possesses the experience, the knowledge and the supporting private and public partner ecosystem to succeed in realizing its vision and delivering its desired outcomes.

Sincerely,

Ben Bajaj
Director, Business Strategy Development

Bridget Barnett
Sales Executive

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RICHMOND
SCHOOL DISTRICT NO.38

BOARD OFFICE - Administration Building
7811 Granville Avenue, Richmond, BC V6Y 3E3
Tel: 604.668.000

February 26,2019

To Whom It May Concern,

This letter voices strong support from School District #38-Richmond for the City of Richmond's "Smart Cities Challenge" proposal themed on Emergency Preparedness.

The City of Richmond staff involved in this proposal have been a superb group of highly organized and intelligent workers, who have been openly inclusive with all stakeholders within our City to best plan improvements in all aspects of Emergency Preparedness.

As a major stakeholder with this proposal, The Richmond School Board commends the City for undertaking such a vital and complex challenge in affirming their efforts to include all major organizations, businesses, service providers, and emergency personnel in establishing new and greatly improved planning for our entire City in terms of Emergency Management. Via this collaboration, the City has built and maintained exceptionally strong ties with these groups as working partners.

Serving in my role as District Administrator - Emergency Preparedness and Seismic Upgrade Liaison, the close and supportive relationship between City staff, Operations and the School District has strengthened considerably, with information, resource and technology sharing and partnering being results of this proposal's work.

I cannot speak highly enough of the collegial and collaborative approach the City team has demonstrated in working alongside all stakeholders in development of this most important proposal.

The direction the City is moving toward with the plan of an integrated city operations hub to allow all stakeholders to be networked and connected through an emergency event will lead to higher efficiency in emergency management.

The Richmond School Board with its schools and other facilities serve over 23,000 citizens within our City, hence selecting emergency preparedness as an area of being a Smart City with all its partners is highly valued and supported by our School District.

Please take this letter of support into strong consideration when awarding the finalist for "Smart Cities Challenge" with the City of Richmond's most worthy proposal.

Yours Sincerely,

M. J. Charlton

Mr. Mike Charlton
District Administrator
Richmond School Board

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Royal Canadian Mounted Police / Gendarmerie royale du Canada

Security Classification / Designation
Classification / Désignation sécuritaire

February 26th, 2019

To whom it may concern,

Your file / Votre référence

Re: City of Richmond's Canada's Smart Cities Challenge Bid

Our file / Notre référence

As a key stakeholder in maintaining and promoting public safety in the City of Richmond, the Richmond RCMP expresses its full support for the City of Richmond's submission to Canada's Smart Cities Challenge. In their bid, the City of Richmond identifies key applications, through technology, that will promote public safety and security in the community and by enhancing communication with residents and stakeholders.

Richmond RCMP shares this vision of increased public awareness and accessibility to emergency planning and preparedness information. The projects identified in the proposal would be instrumental in advancing various aspects of public safety while simultaneously promoting communication platforms. Richmond is a growing city with a diverse population. Its geography and vital infrastructures require significant levels of support and emergency planning. Smart City technology contributes to mitigating risk while also enhancing communication between partner agencies.

In addition, Richmond RCMP also shares a commitment to enhancing road safety. Introducing Smart traffic cameras and street lights will make for safer roadways and will help in reducing the number of traffic accidents. In 2017 Richmond City Council approved funding for CCTV cameras at signalized intersections. The Smart Streets proposal builds on this program providing analytics for innovation that will address improvements to transportation and road safety.

We are confident that the City of Richmond's Smart Cities bid meets the criteria identified by the Government of Canada and will enrich the lives of its residents through innovation, data and connected technology.

Should you have any questions please feel free to contact OIC at 604-207-4718 or via email at will.ng@rcmp-grc.gc.ca .

(Will Ng) Superintendent
Officer in Charge
Richmond Detachment

11411 No. 5 Road
Richmond, B.C. V7A 4E8

Canada

Office of the
Information &
Privacy Commissioner
for British Columbia
Protecting privacy. Promoting transparency.

March 5, 2019

Claudia Jesson
Manager, Legislative Services
City of Richmond
6911 No. 3 Road
RICHMOND BC V6Y 2C1

Dear Claudia Jesson:

Re: Privacy Impact Assessment
City of Richmond
OIPC File F18-76390

This letter is regarding the project proposal by the City of Richmond (the City) for the Smart Cities Challenge conducted by Infrastructure Canada. The letter reviews the proposals submitted in the preliminary privacy impact assessment (PIA) and the PIA data flow and model documents. I have provided comment for consideration in future assessments. Please note that my comments do not fetter the Commissioner's discretion should your initiative later be subject to a complaint or investigation.[1]

The City has engaged with our office throughout their development process. The PIA submitted to our office outlines the proposed projects that the City would seek to deploy over the years as a successful Smart Cities challenger.

I am satisfied that the City is actively considering the legal privacy requirements for public bodies under British Columbia's *Freedom of Information and Protection of Privacy Act* (FIPPA). The City has agreed with this office to complete comprehensive privacy impact assessments on each of their initiatives if their proposal is successful. We are happy to offer continued assistance in the future.

I have separated the following comments by the proposed projects laid out within the PIA and data flow documents.

1. Smart Streets

The purpose of this project is to use surveillance video and sound sensor audio for traffic congestion and incident detection. The City states in the PIA that they will not combine this surveillance and sensor data with other personal information.

Section 26(c) of FIPPA authorizes a public body to collect personal information if the information relates directly to and is necessary for a program or activity of the public body. To establish whether the collection of personal information meets this requirement, public bodies must

[1] For more information, please read our policy on consultations, available at: https://www.oipc.bc.ca/guidance-documents/1432.

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consider the purpose for collecting the personal information, the volume of personal information collected, and the sensitivity of the personal information.

During the procurement phase, the City must consider the resolution of the cameras and the decibel levels of the sound sensors. Depending on the sensitivity of the sensors and the resolution of the cameras, the City could unintentionally collect personal information. Given the volume of personal information, it is advisable for the City to treat this collection as personal information, even if the intent is to minimize collecting information about identifiable individuals. The volume and sensitivity of the information collected will determine whether the City is able to meet the threshold for "necessary" under FIPPA. It our expectation that, prior to the acquisition and deployment of any video or audio surveillance equipment, the City will submit PIAs to our office for review and comment

2. Sustainable Transportation

The City proposes using sensors on charging stations to determine their operational status and to track the electricity channeling through them. Individual users can consent, and download a mobile app to use their current geographical location for determining the location of charging stations. The user will also be able to pay at the charging station or pay through their MyRichmond app. This letter explores the MyRichmond app later.

The City states that users must consent to sharing their device's current geographical location with the mapping service, such as Google or Apple maps. If the City provides this information through an application operated by the City, it should ensure that disclosure to those service providers is authorized by FIPPA, including provisions related to disclosure of personal information outside of Canada.

It is unclear from the proposal whether the City will track the user's payment information and link it with their electricity consumption, beyond what is necessary to process the payment. If the City chooses to link this information and track it over time, they must include this in the project's implementation PIA, alongside the purpose for collection and use.

3. Integrated Smart Alerts and Post Disaster Assessment

The PIA and PIA Data Flow model documents outline six strategies for integrated smart alerts and post disaster assessment. Information from transportation and utility stakeholders , electric charging station locations and availability, and general sensors, such as those monitoring water levels, water pressure, water flow, and seismic activity, are unlikely to include the collection of personal information.

One of the proposed strategies involves the use of drones to assess damage to buildings and dikes. The City could collect personal information if the drones capture the image of individuals when conducting their assessments. The City proposes minimizing the risk of collecting personal information through drones by de-personalizing the video data. However, the PIA data flow document and PIA are unclear about how this would be accomplished. This is an area for future development in an implementation PIA, as there are still potential privacy risks with the use of drones. The City should consider policies limiting the range a drone can operate away from its pilot when conducting assessments. By keeping drones closer to the pilot, the pilot can be aware of where bystanders are and avoid collecting their personal information. These policies will assist in reducing the inadvertent collection of personal information.

The City proposes using video cameras to detect breakage and damage at pump stations and dikes. More information would be required to determine the location of cameras, notification signage, quality of cameras, and the likelihood of the City capturing the images of individuals, including employees, on these cameras.

Finally, the City proposes collecting emergency contact information for residents in order to send emergency communications and, to those interested the Blockwatch newsletter. This involves the indirect collection of information about individuals. It will be a challenge for the City to find a legal authority for this collection. I look forward to working with the City to discuss solutions to this challenge.

4. Renewable Energy Source for Emergency Assets

These projects propose using a supervisory control and data acquisition system to gather and analyze data about power availability and consumption. Sensors are located on power generators, as well as bus shelter displays and highway signage, and used to create a real-time visualization and analysis of electricity consumption.

Based on the information provided, it does not appear that the City uses individual's homes or BC Hydro data in the creation of this dataset. Therefore, I am satisfied that this portion of the proposal does not involve personal information. If the City proposes using individual home data or BC Hydro data, which involves data about individual residences, our office expects the City to consult with us and provide a PIA.

5. Integrated Municipal Operations HUB

Sensor data from the projects above will feed into an integrated HUB, providing operators with a dashboard of information about the status of water systems, sustainable energy systems, city buildings, and dykes. The PIA data flow and model also propose the integration of partner systems data, such as bus, flight, and port schedules. Partners would register with the City to obtain their own copy of the dashboard data via an application programming interface. The City states that none of the information involved in the integrated municipal operations HUB will contain personal information.

Should any systems that feed into the dashboard involve personal information; the City will need to comply with FIPPA's authorities for use and disclosure, as well as consider de-identification as a means of mitigating privacy risks. Depending on the quantity of data involved, adequate de-identification of personal information may be a challenge. The more information the City combines, the more challenging it is to be confident that re-identification of the individual is improbable, especially if the data is also shared with partners.

Despite no obvious personal information being involved in the integrated municipal operations HUB, I recommend the City conduct a thorough analysis of the proposal once all datasets and information flows have been finalized for the purposes of evaluating whether the project will collect, use or disclose any personal information.

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6. MyRichmond

MyRichmond is an existing city services web portal that connects individuals with city services relevant to their needs. Individuals must register with a name and email address. Depending on the services used, MyRichmond may ask individuals for their date of birth, phone number, and mailing address. Using a unique identifier from the web portal, an individual can link their different accounts in multiple city systems. As part of the Smart Cities Challenge, the City seeks to expand the MyRichmond portal to provide services to businesses with MyBusiness.

Based on the information provided, the portal also features, or will feature, the collection of third party personal information for the emergency plan (ePlan) for families, which brings emergency contact, family member, and insurance information into one place. The legal authority or purposes for collection of this information are not clear. Given the quantity of personal information involved, the program must undergo further analysis to ensure compliance with FIPPA.

The preliminary PIA does not comprehensively evaluate MyRichmond or differentiate between what is existing and what is new. I recommend the City write or update the PIA for MyRichmond in its current form and submit it for review and comment by our office. This should occur prior to further expansion of the program so that we can review the City's authorities for the collection, use and disclosure of any personal information. The City should also evaluate the MyBusiness proposal and determine what, if any, personal information would be involved in that program.

7. Integrated Communications Tools

Leveraging the information in MyRichmond, such as the ePlan and profile information, the City proposes using the information for the purpose of emergency preparedness and notification of individuals. Using specific geographical data from MyRichmond, the City intends to contact individuals and tell them about areas of risk. The City does not anticipate sharing any of this information with external partners.

The use of data from MyRichmond for communication depends on the purpose for collection that the individual received notice of when they registered for the service. As part of their assessment of MyRichmond, the City should review its notification statement at the time of collection and ensure that it is clearly communicating the use of the individual's personal information in the integrated communications tool.

Further, if the City wants to share any of the information from MyRichmond with external partners, the City should complete a PIA and ensure they adequately communicated the new use and disclosure to the individual. Otherwise, the City may need to seek consent from the individual for a new use of their personal information.

Another part of the integrated communications tool is "Let's Talk Richmond." The PIA data flow and model states that the City is creating a database using the individual's first and last name, postal code, and any messages the individual sends the City. It is not clear from this document or the PIA why the City would need to link an individual directly to all messages or how long the data is stored within the database. I recommend the City conduct a PIA of the "Let's Talk Richmond" platform, with particular attention to the purpose of the database and retention of the information, in order to identify what provisions of FIPPA authorize the collection and use of personal information.

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8. Smart Way-Finding Solution

In order to improve the way Richmond citizens move through their environment, the City proposes collecting and tracking information about individuals. Some of this information would be collected from individuals when their devices connect to the City's complimentary Wi-Fi service or when charging their devices at a smart kiosk. The City would collect other information through online information technologies that assist individuals in navigating the city.

It is not clear from the PIA or the PIA data flow and model how the City intends to notify individuals of the purpose for this collection of personal information. The City should consider whether it requires this data in an identifiable form or whether de-identified data is sufficient for city planning. Finally, the City must also determine whether it will disclose this information with any external partners. Depending on the quantity of information collected, it may be difficult for the City to gain assurance that the personal information is adequately de-identified and impossible to re-identify, in accordance with FIPPA.

Conclusion

The City has clearly indicated a commitment to creating and updating PIAs, bringing in, supporting, and working with project teams to implement privacy in the design of projects, create governance and privacy management programs, and continue to engage with this office as the local privacy regulator.

Therefore, I am satisfied with the City's commitment to making privacy a core pillar of their smart cities projects.

If you have any questions, please contact me directly by telephone at (250) 953-4195 or by email at cgillespie@oipc.bc.ca.

Sincerely,

Christopher Gillespie
Policy Analyst

MDA

February 27, 2019

To Whom It May Concern,

I am writing this letter to express MDA Systems Ltd.'s ("MDA") strong support for the City of Richmond's Smart Cities Challenge Proposal to develop resilient physical and virtual platforms that are integrated seamlessly across all levels of government to enhance quality of life in day-to-day activities and minimize community impacts from major disasters.

MDA is pleased to be a participant in this proposal. We have worked closely with the City and its partners to develop the proposed concept that will bring great benefits to both Richmond and Canada.

MDA is launching a new Smart City service offering focused on early flood detection and alert and post disaster recovery using big data from sensors and satellite imagery and predictive analytics and machine learning technologies, so we are particularly interested in this aspect of Richmond's Proposal. MDA intends to team with the City of Richmond as our launch customer for our Smart City offering and our Smart3D APS data commons platform, which we intend to market across Canada and Internationally.

The concept and technologies to be developed as part of the proposal are readily transferable to other Canadian cities and thus will benefit all Canadians. Additionally, the international market for the proposed solutions is large and expanding rapidly hence providing excellent growth opportunities for Canadian Industry to sell our solution abroad. From an MDA specific perspective, we are excited about the opportunity to market the technical solutions developed under this project to our worldwide customer base.

Finally, for over 40 years, MDA based its corporate headquarters in Richmond and many of our employees are residents of Richmond. We maintain a close relationship with Richmond and we understand the benefits that this proposed project will bring to the City and its residents – this is the right project at the right time.

I trust that you will find this proposal complete and I ask that you give it the consideration and support that it deserves. Please do not hesitate to contact me directly should you require any additional information.

Yours truly,

Terry Tarle
Senior Director,
Enterprise Geospatial Solutions
MDA System Ltd

MDA Systems Ltd. • 13800 Commerce Parkway, Richmond, British Columbia, Canada V6V 2J3
www.mdacorporation.com • Telephone: 604-278-3411

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KPU | KWANTLEN POLYTECHNIC UNIVERSITY

»» Where thought meets action

February 25, 2019

Smart Cities Challenge Jury
c/o Infrastructure Canada

To Whom It May Concern:

On behalf of Kwantlen Polytechnic University, I am delighted to provide this letter of support for the City of Richmond's Smart Cities Challenge submission.

From the very first conversation we had with the City of Richmond, we were impressed with the overall vision for the challenge statement, along with the intensely collaborative and consultative process used to develop the submission.

This project is fully aligned with KPU's mission: "By thinking and acting together we transform lives and empower positive change."

The City of Richmond has harnessed the knowledge and expertise of industry and sector experts from a vast array of specializations. What began with wide-ranging discussions about "what might be" and "what could be" was eventually distilled into a focused and targeted plan that has the power to be transformational for this Island City.

In addition to the collaboration with stakeholders and members of the advisory committee, the city reached out to the public for input, taking advantage of both online and face-to-face opportunities to showcase the approach taken and the myriad benefits for the city and its residents.

Richmond is a culturally diverse, cosmopolitan city of contrasts: from high-density condo towers to sprawling agricultural lands, a historic fishing village and a vibrant arts and cultural community, it is a thriving, bustling city of nearly 223,000 people, many of whom report that their mother tongue is a language other than English.

It is home to an international airport that serves nearly 29 million passengers, thriving port operations that support millions of dollars in economic activity, and 24 hotels.

These assets also present some challenges for the city, especially when it contemplates minimizing the impacts of a natural disaster. From this reality, Richmond's Challenge Statement was developed, and that statement has been the touchstone of the process to develop the overall submission.

Importantly, the project outcomes have been designed to improve the daily lives of those who live, work and play in Richmond. These outcomes will not just be "activated" during an emergency; they will improve everything from traffic flow to day-to-day communication in multiple languages, the delivery of city services and improved social resilience.

.../2

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KPU | KWANTLEN POLYTECHNIC UNIVERSITY

»» Where thought meets action

KPU has been pleased to be partner in this project, which has allowed both faculty and students the opportunity to work alongside the city and other stakeholders on various aspects of the project.

Indeed, we have identified a trio of areas in which our faculty and students will be able to engage directly, including:

- **Emergency Non-verbal communication:** Assisting in the development of a suite a tools to be used to communicate with the public through the use of symbols and info-graphics rather than language;
- **Early Warning System Pilot Project Liquefaction**: KPU will contribute to the study of the most effective sensors to evaluate ground movement during a seismic event that will be integrated into the post disaster assessment. This project will be linked into the MDA led Innovation SuperClusters Initiative project and the PPR program with EMBC; and
- **Design of the Intelligent Operations HUB**: KPU through the Wilson School of Design will help develop plan for the operations centre to ensure functionality and maximize space.

With one of our campuses located in the City of Richmond, the outcomes of the Smart Cities plan will directly benefit our students and our employees. The collaborative and consultative approach taken to create the final submission will also serve this city well. The relationships forged and connections made throughout this process have been invaluable, not just for the city but for each of its stakeholders and partners.

The City of Richmond's Smart Cities Challenge submission is strong in both substance and foundation.

We are proud to have been part of its development, and we look forward to being a partner in its activation.

Sincerely,
KWANTLEN POLYTECHNIC UNIVERSITY

Marlyn Graziano
Vice President, External Affairs

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HEMBC
Health Emergency Management

February 28, 2019

To whom it may concern,

This letter is written in support of the City of Richmond's application for the Smart Cities Challenge.

Health Emergency Management BC (HEMBC) provides expertise, education, tools, and support for the BC health authorities to effectively mitigate, prepare for, respond to, and recover from the impacts of emergency events; ensuring the continuity of health services.

HEMBC staff work across the province, directly with facilities and programs to support a range of activities, including:

- Development of emergency plans
- Training and education
- Emergency exercises
- Emergency response
- Recovery
- After action / lessons learned process.

As the provincial agency responsible for supporting health authorities with emergency management, HEMBC is very pleased to support the City in this application. During an emergency the capacity for the City to coordinate activities internally and with its external partners is critical. As one of the City of Richmond's emergency response partners, our ability to easily interact with each other and share information rapidly would be enhanced by the integrated city operations hub. The bringing together of services to coordinate from one location for their day-to-day business will only serve for a more efficient and effective response to an emergency incident.

We wish the City of Richmond every success in this application.

Yours sincerely,

Mark R Phillips		Penelope Mador
Mark Phillips	Scott Blessin	Penelope Mador
Director	Manager	Coordinator

Health Emergency Management BC Lower Mainland Team

fraserhealth | Providence Health Care | Provincial Health Services Authority | Vancouver Coastal Health

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BRITISH COLUMBIA

February 26, 2019

To Whom it May Concern:

Re: Richmond Smart Cities Challenge Proposal

On behalf of Emergency Management British Columbia's (EMBC) Disaster Mitigation Branch, I want to express my support for the City of Richmond's Smart Cities Challenge proposal.

One of EMBC's key strategic priorities is to actively educate, engage, and empower communities and individuals to prepare for and recover from emergencies. In line with this, Richmond's Smart Cities Challenge project will take an innovative approach to preparing for and monitoring seismic and flood events.

The City of Richmond is strategically leveraging two major Provincial seismic initiatives to mitigate seismic risks associated with the periods before, during, and immediately after a major earthquake. One of the initiatives relies on the provincially funded earthquake early warning system being implemented by Ocean Networks Canada and the University of Victoria. The system will provide advance earthquake notification using a network of sensors located off and on the shores of Vancouver Island. The notification, delivered to Operations Centres in Richmond, could provide up to 90 seconds of warning before damaging seismic waves arrive.

Another seismic initiative put forward by the City of Richmond is the Prioritized Post-earthquake Response (PPR), which is a system that provides real-time information on the performance of critical facilities in an earthquake and helps response agencies with decision-making in emergency response. The project includes the installation of 10 sensors across the City on municipal and Provincial assets. Data from the sensors will be integrated onto the BC Smart Infrastructure Monitoring System and shared between Richmond and the Province as well as other interested stakeholders. This system will directly monitor critical facilities within the City of Richmond and inform business continuity strategies following a major earthquake.

EMBC supports these smart initiatives and believes they will help prepare the City of Richmond for seismic and flood hazards and significantly reduce the risks posed by these hazards.

Sincerely,

Jesal B. Shah, M.Sc., P.Eng., MBA
Director – Disaster Mitigation Branch
Emergency Management BC

Ministry of Public Safety and Solicitor General
Disaster Risk Reduction
Emergency Management BC
Mailing Address:
PO Box 9201 STN PROV GOVT
Victoria BC V8W 9J1
Location:
Block A – Suite 200
2261 Keating X Road
Saanichton BC V8M 2A5
Telephone: 250 952-5013
Facsimile: 250 952-4871

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BCIT™

BRITISH COLUMBIA
INSTITUTE OF TECHNOLOGY

Aerospace Campus
3800 Cessna Drive
Richmond, British Columbia
Canada V7B 0A1

bcit.ca

Re: Smart Cities Challenge

To whom it may concern:

I am pleased to write this letter of support for the City of Richmond Smart Cities Challenge proposal submission. The outcome of this project will improve the daily lives of citizens through the protection of our island city, the integration, emergency communication platform, the understanding and bridging the language barriers as well as the creation of the mobility systems to enhance everyday life.

The City of Richmond Smart Cities Challenge project has undertaken instrumental work for our community. We, at BCIT, are confident it has the necessary experience, knowledge, support and resources to succeed, and be able to continue long after the competition concludes.

We at BCIT will continue to promote and support the City of Richmond Smart Cities Challenge in any way we can. BCIT has a well-developed and award winning drone programming and repair program. They will work with the City and MDA on implementing the drone program for dike assessment, emergency response and post disaster assessment.

With the collaborative approach that the City of Richmond took with the Advisory Committee and Stakeholders throughout the process of the application development, we at BCIT are confident that you will give this application the attention and examination it deserves.

Sincerely,

Sanja Boskovic, PhD Mechanical Engineering, PhD Educational Technology

Associate Dean, Aerospace Technology Campus, BCIT

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real time data. real time decisions.™

Aware360 Ltd.
1201 Glenmore Trail SW – Unit 250
Calgary, AB T2V 4Y8

March 1, 2019

Smart Cities Challenge Jury
c/o Infrastructure Canada

Dear Jury Members:

It is without hesitation that I am writing this letter of support for the City of Richmond's bid for the federal Smart Cities Challenge. I have had the opportunity to participate in the group calls and presentations leading up to the submission and have been impressed by the scope of the initiative and the quality of the participants and stake holders from the City and the City's partners.

Aware360 focuses on being a worldwide leader in people safety, helping everyone stay connected, safe and aware, wherever they are. We create and adapt people-focused technologies for our clients, giving them confidence that their people are always safe and productive. Aware360 is a technology company focused on leveraging the Internet of Things to provide "people safety," rather than "thing information." With over 15 thousand people and assets monitored daily, Aware360 gives employers the ability to track and maintain the health and safety of their employees.

The potential opportunities between Aware360 and the City of Richmond are focused on three main sections, these being; data sharing (where applicable), project 2.1 – integrated smart alerts and post-disaster assessment, and project 2.3 integrated intelligent operations hub. We are excited to help the City exceed their goals for real-time safety and response as they implement technology to improve safety and the quality of life for their citizens.

I am confident that the City of Richmond's bid represents a significant value for citizens and the greater stakeholder ecosystem. I am impressed with the collaborative approach to the bid and look forward to hearing about the positive outcomes from their developed implementation plan.

Sincerely,

Robert Forget, B.Sc.EP, MBA, C.Mgr
CTO

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Smart Streets Technology

1.1 CREATE SMART STREETS THROUGH CONNECTED SENSORS AND DECREASE THE NUMBER OF TRAFFIC COLLISIONS:

1. Install:
   - Smart street lights on roadways with LED lighting, high definition motion sensors, sound sensors, and Wi-Fi;
   - Fibre optics and deploy smart cameras at high risk signalized intersections;
   - GPS Based Emergency Pre-emption System at signalized intersections;
   - Additions to Advanced Traffic Management System (ATMS);
   - Uninterruptible Battery Backup System (UPS) at all signalized intersections; and
2. Enable data flow from smart street infrastructure locations to central HUB.

1.2 CREATE SUSTAINABLE TRANSPORTATION THROUGH RAPID TRANSITION TO ELECTRIC MODES OF TRANSPORTATION:

1. Increase infrastructure required to charge electric vehicles including buses and quick charge for buses and trucks;
2. Install technology for all road users including transit priority, future deployment of autonomous vehicles and e-bike charging stations;
3. Develop mobility hub networks at strategic locations to support interregional transportation, emergency response, and priority charging stations at the airport, hospital, police station and fire halls;
4. Develop software to link assets to central HUB; and
5. Create applications to identify key assets including electric vehicle charging stations.

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Smart Disaster Mitigation Technology

2.1 INTEGRATED SMART SENSORS THAT SUPPORT INFRASTRUCTURE MANAGEMENT AND POST DISASTER ASSESSMENT:

1. Develop an Environmental Quality Sensor Network;
2. Install:
   - Utility based sensors
   - City wide sensors to monitor water pressure, water quality, sanitary sewer water levels, drainage system water levels, air quality, and rain sensors.
   - Sensors will provide day to day information on system operation and capacity as well as post disaster assessment of municipal utilities and water levels.
   - Air quality sensors
   - Seismic sensors
     - Seismic sensors on municipal facilities combined with initial structural assessment that will facilitate rapid post seismic assessment of these facilities.
   - Drone based LiDAR technology for regular dike assessment and inspection as well as post disaster dike and initial building assessment.
3. Enable data flow from smart infrastructure locations to central Hub;
4. Create a database of senior government and stakeholder assets; and
5. Coordinate all early warning systems.

2.2 INSTALL RESILIENT POWER TO FUNCTION FOR 72 HOURS POST DISASTER FOR KEY ASSETS:

1. Equip vital infrastructure, including Integrated Intelligent Operations Hub, Emergency Operation Centre(s), Emergency Reception Centres and other vital post disaster infrastructure with sustainable power sources to provide at least 72 hours when the central electrical grid is compromised;
2. Ensure way-finding infrastructure such as mobile message/signage boards and digital transit shelter advertising boards can operate for 72 hours if the electrical grid is compromised during a disaster or during power outages;
3. Extend the use of street lights to operate for 72 hours if the electrical grid is compromised during a disaster or during power outages;
4. Integrate sub-metering to promote and measure efficiencies;
5. Support integrated energy dashboards for virtual use and connect to the central HUB; and
6. Work toward utilizing renewable and clean energy sources for back-up power generation.

2.3 CREATE AN INTEGRATED INTELLIGENT OPERATIONS HUB (PHYSICAL AND VIRTUAL):

1. Create a Digital Intelligence platform to allow partners to share data, information and insights in real or near real time;
2. Create an everyday operation centre to manage City operations and integrate cross-functional data collected to seamlessly transition to an emergency operation centre;
3. Create a well-designed and functional physical setting for operations Hub;
4. Work with partners such as E-Comm, BC Ambulance, TransLink, RCMP, The Port of Vancouver, Musqueam Indian Band and Vancouver International Airport, to ensure communication processes and protocols are in place and integrated;
5. Integrate all data collection points to the Intelligent Operations Hub; and
6. Create a mobile application/dashboard to ensure decisions can be made offsite when needed.

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Integrated and Connected Communities

3.1 Implement MyRichmond personalized engagement platform

1. Enable residents and other stakeholders to access a variety of City services and planning and information resources via the MyRichmond online platform using a single identity and password;
2. Create a public dashboard for public assets such as power access across the city, operational gas stations, grocery stores, bus stations for residents and businesses to create individual emergency plans and identify availability of emergency supplies within the community;
3. Provide up to date information on community assets including childcare centres and other community care facilities on Richmond Interactive Map (RIM) for emergency use;
4. Connect businesses to MyRichmond for access to enhanced online civic services and emergency planning resources; and
5. Increase functionality of MyRichmond for users of mobile devices.

3.2 Develop Communication Tools with partners and to promote engagement with diverse populations:

1. Develop a communications network and processes that allows emergency notifications and other public information (from multiple organizations) to be seamlessly and simultaneously delivered to the public from a single source through multiple channels;
2. Develop enhanced emergency preparedness training for residents and businesses;
3. Expand community engagement regarding emergency planning and preparedness;
4. Integrate multilingual communications tools on City information platforms; and
5. Develop emergency preparedness strategies to ensure accessible communication for people with disabilities or others who may be isolated from the general community due to economic, health or other conditions.

3.3 Develop way-finding solutions for everyday and emergency use:

1. Create and implement an integrated way-finding strategy;
2. Collaborate with partner agencies and businesses to provide access to digital screens and message boards within the public domain to deliver real time emergency notifications; and
3. Integrate use of public domain digital assets with online communications to deliver enhanced public service and real time emergency notifications.

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ATIA - 21(1)(a)
ATIA - 21(1)(b)

Jacaban2, Evalynne (INFC)

From: Long, Alexander (INFC)
Sent: April 1, 2019 3:00 PM
To: Hwang, Susan (INFC); Bouchard, Kathleen (INFC)
Subject: FW: FOR CONSULTATION: Climate Lens Assessment Plans - Richmond Final Proposal

FYI – to add to Richmond's CLA assessment.

From: Smith2, Sean (INFC)
Sent: April 1, 2019 11:27 AM
To: Nelson, Chad (INFC) <chad.nelson@canada.ca>; Long, Alexander (INFC) <alexander.long@canada.ca>
Subject: RE: FOR CONSULTATION: Climate Lens Assessment Plans - Richmond Final Proposal

Hi Alex,

[redacted]

I think this addresses our second point, although I don't think it addresses our third. [redacted]

Sean Smith
Infrastructure Canada | www.infrastructure.gc.ca
sean.smith2@canada.ca 613-960-9628

From: Nelson, Chad (INFC)
Sent: March 29, 2019 4:58 PM
To: Long, Alexander (INFC) <alexander.long@canada.ca>
Cc: Smith2, Sean (INFC) <sean.smith2@canada.ca>
Subject: RE: FOR CONSULTATION: Climate Lens Assessment Plans - Richmond Final Proposal

Hi Alex,

I will be away on Monday, but my colleague, Sean (cc'd) can take a look.

Have a great weekend as well,

Chad

From: Long, Alexander (INFC)
Sent: Friday, March 29, 2019 4:34 PM
To: Nelson, Chad (INFC) <chad.nelson@canada.ca>
Subject: FW: FOR CONSULTATION: Climate Lens Assessment Plans - Richmond Final Proposal

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ATIA - 21(1)(a)

ATIA - 21(1)(b)

Hi Chad,

Thanks for your assessment of Richmond's plans re climate lens assessment. Unfortunately the online version does not contain the appendices. I've attached the CLA referenced in the proposal and contained in the appendix. This would address your second point and perhaps your third. [redacted]

Thanks – and have a great weekend!

Alex

From: Poirier2, Eric (INFC)
Sent: March 29, 2019 1:04 PM
To: Long, Alexander (INFC) <alexander.long@canada.ca>
Cc: Tremblay, Jenny (INFC) <jenny.tremblay@canada.ca>
Subject: Fwd: FOR CONSULTATION: Climate Lens Assessment Plans - Richmond Final Proposal

For the Richmond review.

EP

Sent from my iPhone

Begin forwarded message:

> **From:** "Nelson, Chad (INFC)" <chad.nelson@canada.ca>
> **Date:** March 29, 2019 at 12:59:27 PM EDT
> **To:** "Poirier2, Eric (INFC)" <eric.poirier2@canada.ca>
> **Cc:** "Judge, Robert (INFC)" <robert.judge@canada.ca>, Lemieux3, Stéphanie (INFC) <stephanie.lemieux3@canada.ca>, "Smith2, Sean (INFC)" <sean.smith2@canada.ca>
> **Subject: FW: FOR CONSULTATION: Climate Lens Assessment Plans - Richmond Final Proposal**
>
> Hi Eric,
>
> [redacted]

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ATIA - 21(1)(a) ATIA - 21(1)(b)

[redacted]

If helpful or needed, please feel free to have one of your colleagues contact, Sean Smith (cc'd), here in Sectoral Policy, should there be additional questions.

Chad

From: Williams, Tushara (INFC)
Sent: Tuesday, March 26, 2019 11:37 AM
To: Judge, Robert (INFC) <robert.judge@canada.ca>; Nelson, Chad (INFC) <chad.nelson@canada.ca>
Cc: Poirier2, Eric (INFC) <eric.poirier2@canada.ca>
Subject: FW: FOR CONSULTATION: Climate Lens Assessment Plans - Richmond Final Proposal

Robert and Chad
Please could you take a look and get back to Eric with any questions you have?
Thanks in advance for your help
Tushara

From: Poirier2, Eric (INFC)
Sent: March 26, 2019 9:20 AM
To: Williams, Tushara (INFC) <tushara.williams@canada.ca>
Cc: Tremblay, Jenny (INFC) <jenny.tremblay@canada.ca>; Courval, Manon (INFC) <manon.courval@canada.ca>; Long, Alexander (INFC) <alexander.long@canada.ca>; Fletcher-Kyle, Ashley (INFC) <ashley.fletcher-kyle@canada.ca>
Subject: FOR CONSULTATION: Climate Lens Assessment Plans - Richmond Final Proposal

Bonjour Tushara,

As Jenny mentioned at a recent Branch management meeting, there may be a few Smart Cities Challenge final proposals that require the view of policy experts within INFC or beyond to assist in our review process in support of the Smart Cities Challenge Jury.

The Richmond project is within the scope of application of the Climate Lens Assesment process and they have identified in their final proposal their plans to meet their obligations in this regard. Could your CLA folks have a look and give us some feedback about how this lines up with INFC expectations on a CLA?

We have attached the following:

- Richmond Final Proposal section on CLA for review
- Webinar presentation used to explain obligations to finalists for reference (pages 8-12, specifically)
- Finalist Guide excerpt (criteria relevant to CLA are in Chapter 9) for reference
- The full final proposal is online

Any written views would be most welcome by noon on Friday (if at all possible). We would also be happy to meet with your folks to talk this through.

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Au plaisir,
EP

Eric Poirier

Directeur principal, Défi des villes intelligentes
Infrastructure Canada / Gouvernement du Canada
eric.poirier2@canada.ca / Tél: 613-957-2460 (nouveau!)

Senior Director, Smart Cities Challenge
Infrastructure Canada / Government of Canada
eric.poirier2@canada.ca / Tel: 613-957-2460 (new!)

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GHG ACCOUNTING

Climate Lens Assessment of GHG Mitigations under the Disaster Mitigation and Adaptation Fund for the City of Richmond's Flood Protection Program

Commissioning Organization: City of Richmond

Project: Richmond Flood Protection Program

Author: GHG Accounting Services Ltd.

December 2018

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Attestation of Completeness

The undersigned hereby attests that this GHG Mitigation Assessment was undertaken using recognized assessment tools and approaches (i.e., ISO 14064-2: Specification with guidance at the project level for quantification, monitoring, and reporting of greenhouse gas emissions reductions or removal enhancements and, if chosen, the *GHG Protocol for Project Accounting*) and complies with the General Guidance and any relevant sector-specific technical guidance issued by Infrastructure Canada for use under the Climate Lens.

Prepared and conducted by: *Svend Andersen*

Svend Andersen, GHG Accountant, Greenhouse Gas Quantifier

Vancouver, 23rd of December 2018

Notice of Independence:

GHG Accounting Services is not and has never been affiliated with the commissioning organization, its staff, directors or officers. GHG Accounting Services has not and has not been promised or received, compensation beyond the market rate for this assessment and documentation work, or any additional benefits of any kind from the commissioning organization. The project work and documentation have been conducted from an independent, subject matter expert third party point of view.

GHG Accounting Services' commitment is to provide independent, reliable, factual and accurate sustainability accounting services.

Svend Andersen

Svend Andersen, CEO GHG Accounting Services Ltd.

Validation of Activity Data

All technical specifications and activity data used in this assessment have been reviewed by a City engineer:

Based on the review of the information used in this assessment, it is my opinion, to a reasonable level of assurance, that the technical specifications and activity data used in this assessment and chosen scope is supported by the underlying evidence, is true and correct and is free from material discrepancies.

_____

Chris Chan, BASc, EIT

Engineering Planning

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Executive Summary

The sea level rise occurring as part of seasonal changes represents an issue of great concern to the City of Richmond. Therefore, the City of Richmond's 2008-2031 Flood Protection Strategy includes the upgrade of dikes and pump stations to protect the City from flooding events. The BC Sea Dike Guidelines provide the basis of the upgrade work, which specify that to mitigate the effects of climate change, the dike infrastructure that surrounds the City must be elevated up to 4.7m by the year 2100. This project level greenhouse gas (GHG) mitigation assessment calculates, in accordance with the Climate Lens Guidelines, the net emissions from the following project activities that are proposed under the Disaster Mitigation and Adaptation Fund:

1.) upgrading 2.6 km of dike by raising its height to 4.7 m; and

2.) upgrading five existing drainage pump stations by building new pump stations and increasing their pumping power by the year 2027.

The dike upgrades include emissions related to the transport of material and construction, as well as road realignment due to a new dike footprint. The drainage pump upgrades include emissions related to the demolition of the old pumphouses and transport of the waste material, construction of the new pump houses and transport of the construction material, dewatering and bypasses for implementation of the new pumps, as well as the operation of the new pumps. The project activities start in 2019, with construction commencing in 2021 and completion expected in 2027. Operation and maintenance are considered during the lifespan of the dike, i.e. 100 years, and for the pumps, i.e. 50 years. Any flooding event would create significant damage not only to the project site, but also extensive damage to the City of Richmond. In any case, the consequences for the City as a whole and any repairs of such a disaster would result in GHG emissions that significantly exceed the GHG emissions from the planned dike upgrade. However, such consequences beyond the boundaries of the project site are outside of the activity scope of this analysis. Therefore, they have not been included in this assessment.

This GHG assessment was conducted according to Climate Lens Guidelines and aligns with the relevant assessment standard, i.e., ISO 14064-2 and the GHG Protocol for Project Accounting. A total of 8,107.25 tCO2e was identified as the net resulting GHG emissions over the lifespan of the assets, which was calculated by taking the difference between the emissions of a most likely functionally equal baseline scenario and the emissions of the project scenario. The most likely functionally equal baseline scenario identified was a business as usual scenario where no dike or pumphouse construction takes place. To represent functional equivalence, one major flooding event was assumed with sea level rise above the current design height. For the purpose of the timeline-based quantification of the baseline scenario, the flooding event is assumed to happen in 50 years' time, which results in required repair work of the existing dikes. The total GHG emissions of the baseline scenario over the lifespan of the assets were identified to be 1,375.89 tCO2e. The baseline emissions in year 2030 were identified to be 2.73 tCO2e, which represents the annual emissions due to operation of the existing pumps. The total GHG emissions from the project scenario were identified to be 9,483.14 tCO2e over the lifespan of the assets, with project emissions of 5.49 tCO2e in the year 2030, which represent the annual emissions of operating the new pumps until the end of their lifespan in the year 2069. The net resulting emissions in year 2030 were identified to be 2.77 tCO2e due to the power increase of the five upgraded drainage pumping stations.

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1 Introduction and Project Overview

The geography of the province of British Columbia exposes coastal cities to the consequences of seasonal changes and sea level rise. The City of Richmond is surrounded by the Fraser River and the Strait of Georgia, with flat topography and is, on average, only one meter above sea level. This presents geographic conditions that may make the City more susceptible to the effects of sea level rise. In response to forecasts of sea level rise, the City of Richmond bears the responsibility of taking action to adapt the City's flood protection infrastructure. The City of Richmond's current flood protection system involves 49 km of dikes, 622 km of drainage pipes, 178 km of ditches, and 41 drainage pumping stations.

According to Ausenco Sandwell Assessment (BC Sea Dike Guidelines, 2011), by 2100 the City of Richmond presents 1/500 annual exceedance probability (AEP), which represents the risk of one particular event (e.g., a storm or a storm surge) happening in the period of 500 years. As per the BC Sea Dike Guidelines Standard, for 1 in 500-year consideration, the dikes will need to be at 4.7m by the year 2100.

In 2008, the City Council endorsed the 2008-2031 Flood Protection Strategy Plan, in which the City of Richmond outlined the system of defense, including pumping stations with higher capacity and strategically higher dike levels as two measures out of ten to mitigate the effects of sea level rise.

Using the Climate Lens Guide, the Greenhouse Gas (GHG) Mitigation Assessment was conducted for the project activities. The project activities include the elevation of dikes (with a total length of 2.6 km) to up to 4.7m height, protecting the area from the expected seawater level rise; and the construction of five pump stations with increased pumping capacity to mitigate forecasted increase in rainfall intensities.

The project includes a planning phase starting in 2019, which involves the Completion of Preliminary Design, the Completion of Detailed Design, External Approvals (including WSA), Construction Tendering, Substantial Completion and Commissioning. The construction is planned to start in the year 2021 with the construction of higher capacity pump stations and completion of construction works by 2027.

The objective of this assessment is to quantify the anticipated GHG emissions impact of the infrastructure project and analyze the GHG emissions of related activities in: (i) the baseline scenario; (ii) during the years of construction; and (iii) in the operational phase of the dike and pumping stations.

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2 Methodology

The quantification of GHG emissions was conducted according to the Climate Lens Guidelines and aligns with the relevant assessment standard, i.e., ISO 14064-2 and the GHG Protocol for Project Accounting. In addition, the assessment adheres to the following principles identified in the GHG Protocol on Project Accounting:

• Relevance: The data, methods, criteria and assumptions must be appropriate for the quantification of GHG effects from the project.

• Completeness: All relevant information related to GHG estimation, including choice of baseline, must be included in the proposal.

• Consistency: All data, methods, criteria, and assumptions must be applied consistently in the GHG assessment to ensure meaningful comparisons.

• Transparency: All data, methods, assumptions, and calculations, must be clearly explained in order for proposal evaluators to assess the credibility and reliability of the GHG reduction claims.

• Accuracy: Uncertainties must be reduced as far as practical by using unbiased GHG measurements, estimates and calculations.

• Conservativeness: Assumptions, values and procedures must be conservative to ensure that GHG reductions are not overestimated.

2.1 Boundary of the Assessment

2.1.1 Location

The planned pump upgrades and dike improvements are located in the City of Richmond. A map of the project sites is shown in Annex I, presenting the location of one dike at the North East River bank of the Fraser River, and the other dike located at the South Eastern corner of the Fraser River. The Pump Stations are located as follows:

- Station 1 - Ewen Rd: 7702 No 9 Road, City of Richmond
- Station 2 - No 6 Road South: 11002 No 6 Road, City of Richmond
- Station 3 - McCallan Road North: 4002 River Road, City of Richmond
- Station 4 - No 9 Road at Westminster Hwy, City of Richmond
- Station 5 - Gilbert Rd & Steveston Hwy: 11022 Gilbert Road, City of Richmond

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2.1.2 Timeline

For the dikes and pump station upgrades, the preparation start date is January 1st, 2019. Construction is projected to start in the year 2021 and will be completed by the end of 2027. The asset lifespan of the dikes is 100 years. The asset lifespan of the pumps is 50 years.

Table 1: Timeline and Project scenario workplan of Activities that are included in the GHG assessment

PROJECT SCENARIO WORKPLAN											
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	...2118
Completion of Preliminary Design, Completion of Detailed Design,External Approvals (including WSA), Construction Tendering,Substantial Completion and Commisioning											
Activity G: Demolition of old pump houses and transport of waste material											
Activity H: Transport of construction material for pump stations											
Activity I: Construction of pump stations											
Activity J: Dewatering and bypass											
Activity C: Transport of material for dike construction											
Activity D: Construction of the Dike											
Activity E: Transport of road material and realignment of road											
Activity K : Pump operation											

2.1.3 Activities

The identification of project activities is divided into two areas: 1.) raising 2.6 km of existing dikes to a level of 4.7 m, and 2.) upgrading five drainage pump stations by increasing the pumping power and replacing parts of the pump station housing. A schematic of the two areas is shown in Figure 1.

The individual project activities within the boundaries of this assessment are listed in Table .

The project activities for the dike upgrades include the transport of materials from a material yard to the dike, the raising of the dike, and the road realignment due to a wider footprint of the dike. The transport of materials from the yard to the dike encompasses all vehicle trips necessary to transport all materials to the site to the construction field. No empty return trips are included, because it is unclear if vehicles are assigned any other tasks afterwards to transport, for example, waste material. Economic pressure will limit the number of empty trips. It is estimated that the distance from each dike is 30km from the source of material.

During the construction of the dike upgrade, GHG emissions from the machinery for dike raising and the road realignment have been considered. The calculation of GHG emissions of vehicles working on the site will be based on the period of time the machines spent to build the dike. The machinery considered include the excavator, backhoe, dump truck, and roller for the compaction of soil. A detailed list of all emissions associated with the individual project activities and the assumptions used for calculating the associated emissions is outlined in paragraph 4 and 2.6., respectively.

The project activities for the pump station upgrade include demolition of the old pump stations, rebuilding of the pump stations, dewatering and temporary bypasses for pump replacement, and operation of the new pumps with increased pumping power. During the demolition of existing buildings, GHG emissions created by the transport of demolished materials and onsite machinery are taken into account. The calculation of transport of demolished materials is based

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on the square footage of each type of building and standard assumptions of construction. The distance considered between the construction site and the recycling facility is 15km. The onsite machinery is calculated based on the fuel consumption of the equipment and estimated hours on-site to demolish a 500 ft2 building and a 150 ft2 kiosk. In the construction phase, only the concrete mixer is included in the assessment as on-site machinery. The placement of the concrete mix into the formworks is considered to be done through workmanship and a pump tube connected to the concrete mixer, while the construction of external walls of concrete block masonry is considered to be placed by workmanship.

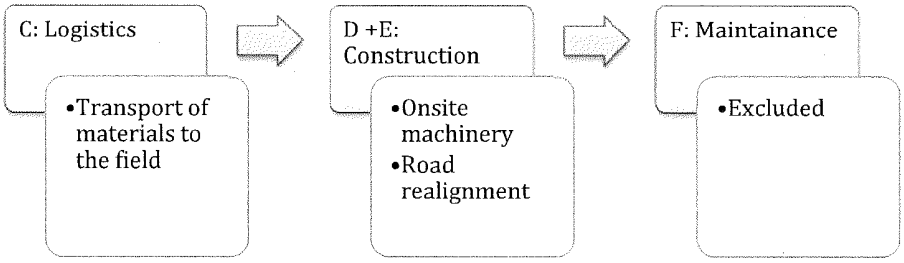

Figure 1: Flow diagram of Activities from dike construction and maintenance

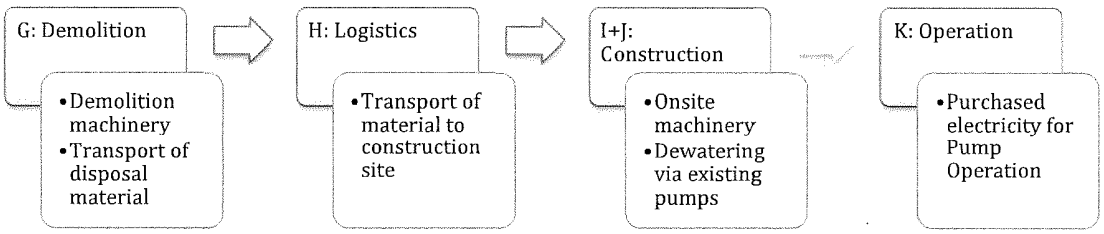

Figure 2: Flow diagram of GHG emissions from the construction and operation of the pump station upgrades

Table 2: Project and baseline activities

	Activity Name	Brief description of activity
Activity A	Transport of material for dike repair	Material for the dike repair work will be transported from a material yard to the dike. The distance is 30 km.
Activity B	Dike repair	Repair of the dike includes machinery such as an excavator, backhoe, dump truck and roller. It is assumed that 10 m of dike range will be built per day.

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Activity C	Transport of material for dike upgrade	50 m^3 or 97 tonnes of dike building material per meter of dike will be transported from a material yard to the dike. The distance is 30 km.
Activity D	Construction of dike upgrade	Construction of the dike includes machinery such as an excavator, backhoe, dump truck and roller. It is assumed that 10 m of dike will be built per day.
Activity E	Transport of road material and realignment of road	The raising of dike results on the realignment of the existing road. This requires the transportation of material and construction machinery, e.g. a roller.
Activity F	Maintenance of dike/ Landscaping	Maintenance of dike and landscaping of the dike will be conducted in similar scope in both, the project and the baseline scenario.
Activity G	Demolition of old pump houses and transport of waste material	The old pump houses will be demolished using heavy machinery and an estimated 360,600 tonnes of waste will be transported for 15 km from the construction site to the recycling facility.
Activity H	Transport of construction material for pump stations	An estimated 360,600 tonnes of building material will be transported from the material yard to the pump stations. The distance is 30 km.
Activity I	Construction of pump stations	5 pump stations will be upgraded in the project scenario. All existing wet wells and underground connections will be kept in place. Construction of the pump houses include heavy machinery.
Activity J	Dewatering and bypass	For installation of the new pumps, a temporary bypass upstream the pump will be used. For dewatering, up to 50% of the pumping capacity will be used until the wet well is empty.
Activity K	Pump operation	The pumps are operated on electricity. The pump upgrade includes more pumping power and therefore a higher electricity demand.
Activity L	Pump maintenance	Maintenance of the pumps and pump stations will be conducted in similar scope in both, the project and the baseline scenario.

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2.2 Greenhouse Gases Considered

2.2.1 Sources

Table 1: Emission sources considered in the assessment

	Activity Name	Scope	Type of Emission Source	Included/ Excluded	Explanation
Activity A	Transport of material for dike repair	1	Diesel fuel dump truck	Included	Dike repair work is only necessary in the baseline scenario
Activity B	Dike repair	1	Diesel fuel machinery	Included	Included in the baseline scenario only
Activity C	Transport of material for dike	1	Diesel fuel dump truck	Included	Included in the project scenario only
Activity D	Construction work to upgrade the dikes	1	Diesel fuel machinery	Included	Included in the project scenario only
Activity E	Transport of road material and realignment of road	1	Diesel fuel dump truck	Included	Included in the project scenario only
Activity F	Maintenance of dike/ Landscaping			Excluded	The emissions from this activity will be the same in the project and the baseline scenario and are therefore excluded
Activity G	Demolition of old pump	1	Diesel fuel dump truck	Included	Included in the

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	houses and transport of waste material		and concrete pump		project scenario only
Activity H	Transport of construction material for pump stations	1	Diesel fuel dump truck	Included	Included in the project scenario only
Activity I	Construction of pump stations	1	Diesel fuel construction machinery	Included	Included in the project scenario only
Activity J	Dewatering and bypass	2	Electricity	Included	Included in the project scenario only
Activity K	Pump operation	2	Electricity	Included	Included in the project and baseline scenario
Activity L	Pump maintenance			Excluded	The emissions from this activity will be the same in the project and the baseline scenario and are therefore excluded

All emissions are converted into CO2 equivalent (CO2e) using the Global Warming Potentials identified in the most up-to-date version of Canada's National Inventory Report (Table 1a,1b) and reported in tonnes (t), kilotonnes (kt), or megatonnes (Mt).

2.2.2 Sinks

No GHG sinks are identified in this project.

2.2.3 Reservoirs

No GHG reservoirs are identified in this project.

2.3 Emission scopes

Table 2: Emission sources, scopes, and emission factors used for GHG emission calculations

Source	Scope	Activity	Unit	t CO_2e/unit	Reference

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		of Measure		
Diesel use for transport and construction vehicles	1	Liters	0.0263	B.C. Best Practices Methodology for Quantifying Greenhouse Gas Emissions
Electricity use pump operation	2	GWh	10.67	B.C. Best Practices Methodology

2.4 Data Collection and Calculation Procedures

The selection of sources and calculation procedures of greenhouse gas emissions is based on the ISO 14064-2 Standard and the GHG Protocol. The data collection is based on the project plan and are calculated in a conservative manner.

Due to a lack of existing GHG quantification protocols for dike construction and pump station upgrades, the following considerations have been made in determining the GHG emission reductions:

1 Wherever possible, actual data was used in quantification calculations rather than estimates or statistical industry considerations.
2 The baseline scenario was quantified using the actual BC Hydro electricity utility data for the 5 pump stations in the years 2010 until 2017.
3 The GHG emission sources, sinks and reservoirs were limited to controlled, material and relevant ones, namely the transportation of the material, operation hours of construction material, and electricity use of the pumps.
4 The existing typical cross section of the BC Sea Dike Guidelines (2011) supported the calculation of the top soil material needed to the partial restauration of the dike in the assumptions of forecasted maintenance.

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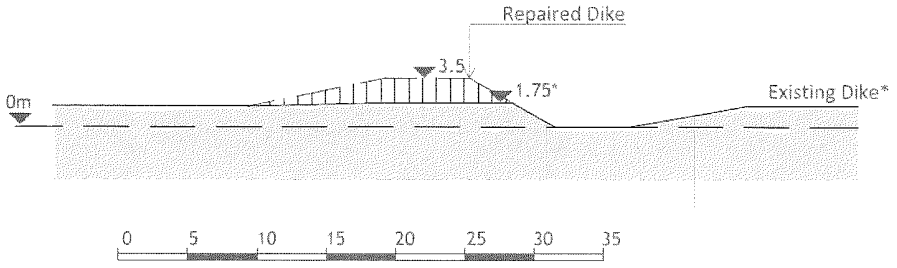

Cross Section of upgraded Dike. GHG Accounting Services Ltd. based on BC Sea Dike Guidelines (2011, Appendix C, Page 9)

2.4.1 Dike Material

The following considerations have been made when estimating the material usage for the dike upgrades. The filling material estimated to the elevation of the dike to up to 4.7m is from 50m³ of material per meter of dike, specifically 38m³ of filling, 6m³ of topsoil with 0.3-meter-deep and 6m³ of riprap.

2.5 Exclusions from the Assessment

- Excluded from this assessment are the GHG emissions in the supply chain of the project, excluding emissions of the manufacturing of bricks, and the lifecycle of possible recycled materials in the road realignment.
- Any flooding event in the baseline scenario would create significant damage not only to the project site, but also extensive damage to the City of Richmond. In any case, the consequences for the City as a whole and any repairs of such a disaster would result in GHG emissions that significantly exceed the GHG emissions from the planned dike upgrade. However, such consequences beyond the boundaries of the project site are outside of the activity scope of this analysis. Therefore, they have not been quantified.

2.6 Assumptions

2.6.1 Dike Repair in Baseline Scenario

- The likelihood of a flooding event is assumed to be high during the lifespan of the assets, resulting in the destruction of parts of the dike and required dike repair work.
- The flooding event is assumed to happen at least by the year 2069. (Estimate)
- 50% of the dike will need to be replaced due to a flood or natural disaster in 50 years.
- This is equivalent to replacing the top 1.75 m of the existing dike. (Estimate)

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- 21.94 m3 of material will be needed per meter of dike repair. (Estimate)
- The building material per meter of dike repair consists of 12% topsoil, 12% riprap, and 76% ordinary damp sand with a density of 1850 kg/m^3, 2600 m3/kg, and 1850 kg/m^3, respectively. This results in a material density of 1940 kg/m^3.
- The distance between the material yard and the dike is 30 km. (Source City of Richmond)
- 10 meter of dike are repaired per day using an excavator, backhoe, dump truck and roller for 8 h, 10 h, 5 h, and 4 h, respectively.

2.6.2 Dike Upgrade in Project Scenario

- 50 m^3 of building material are used per meter of dike length.
- The building material per meter of dike consists of 12% topsoil, 12% riprap, and 76% ordinary damp sand with a density of 1850 kg/m^3, 2600 m3/kg, and 1850 kg/m^3, respectively. This results in a material density of 1940 kg/m^3.
- The dike building material comes from a material yard 30 km away from the dike building site. (Source: City of Richmond)
- A 15t dump truck is used to transport the building material from the material yard to the dike building site with a fuel efficiency of 0.77859 l/km (Source: GHG Genius).
- 10 meters of dike are constructed per day using an excavator, backhoe, dump truck and roller for 8 h, 10 h, 5 h, and 4 h, respectively.
- 40 m^3 of asphalt are needed per meter of road that needs to be realigned.
- The road material is transported from a source that is located 30 km away from the construction site. (Source: City of Richmond)
- 2600 m of road will be realigned due to widening of the dike.
- A roller will be used for 4 hours per day for the construction of the road.
- We assume that the emissions associated with operation and maintenance of the dike are the same in the baseline and the project scenario throughout the lifespan of the assets.

2.6.3 Pump Stations Upgrade

It is assumed that the pump stations' architectural features follow the references of the existing kiosk pump stations. The calculation of building materials, both for construction and demolition, were based on standard measures of construction, guided by the City of Richmond blueprints of the existing pump stations. In this project, two different types of buildings are considered, the kiosks and regular buildings.

Before starting the new construction of the pump houses, the old pump houses will be demolished and the waste material will be transported to a waste facility. The following assumptions are taken into account for demolition and waste disposal:

- The weight of the demolition waste material is equal to the weight of the building material of the new pump houses.

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- The waste disposal facility is 15 km away from the pump house construction site. (Source: City of Richmond)
- Demolition machinery is assumed to be an excavator.
- The average production rate of the excavator to demolish concrete was assumed to be 115 m^3/8 hours, 14.37 m^3/h. Therefore, the time estimated to demolish 180.3m^3 of building material *(30.6m^3 from two kiosks pump stations + 149.7m^3 from three pump stations)* is 13 hours of excavator work.

Two different pump house building types are considered in this assessment: kiosk and regular building. The kiosks have concrete structural elements and glass framed shell, with approximately 150 square feet. The material calculated with respect to the construction shell includes the external walls and the structural elements. The regular building features are considered to be built with concrete structure, external walls on concrete masonry brick, and concrete roof slab, with approximately 500 square feet. The material calculated with respect to the construction shell includes the external walls and structural elements.

It is generally assumed that structural elements such as slabs and beams are fabricated on-site and are included in the calculation of GHG emissions. However, pre-fabricated elements such as door frames, windows and curtain walls are considered reused in the new building, hence they are not included in the demolished material or transported material in the demolition and construction phases respectively. Therefore, only the concrete pump is considered as source of GHG emissions during construction of the pump houses.

The underground structure, such as piles, connections, or wet wells are considered to be reused on the site and will therefore be assumed not to be demolished. Therefore, the calculation includes only the connection of piles to the existing ones.

It is also assumed that the construction of the Kiosk Station 5 - Gilbert Rd & Steveston Hwy will occur simultaneously of the Kiosk Station 4 - No. 9 Rd & Westminster Hwy Storm Pump Station.

Standard measures for the pump house dimensions are assumed as follows:

- Slab thick: 8" (0.20m)
- Roof beams: 2'6"
- Internal beams: 10"
- Masonry Brick width: 5/8'
- Station Internal Height: 10"

Dewatering of the wet well and a temporary bypass are required for the replacement of each pump. These activities are scheduled during the summer and are assumed to take two months. During dewatering, 1 pump will run at a pumping capacity of 50 % for dewatering while the remaining pumps will continue normal operation through a temporary bypass. Existing infrastructure will be used as temporary bypass. Hence, there will be no GHG emissions associated with construction of the temporary bypass.

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2.6.4 Pump Station Operation and Maintenance

- Actual data obtained from BC Hydro meters was used to estimate the increase in energy demand of the increased the pumping power.
- The yearly electricity demand was assumed to increase proportionally to the increase in pumping power at each station.
- The BC Electricity emission factor remains constant.
- It is assumed that the Kiosk Station 5 - Gilbert Rd & Steveston Hwy will have the same equipment, hence the same electricity usage, as the Kiosk Station 4 - No. 9 Rd & Westminster Hwy Storm Pump Station (Dog Kennels), due to its similar architectural features, including size and type.
- GHG emissions for maintenance are the same in baseline and in project scenario and are therefore excluded from the assessment.

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3 Baseline Scenario

3.1 Selection of Baseline Scenario

The Climate Lens Guidance document requires the selection of a baseline scenario that represents the most probable, most conservative and viable scenario in the absence of the proposed project. Also, specific consideration is given to not selecting a "doing nothing" scenario as a baseline, because it may not represent a realistic and viable alternative to the project given regulatory requirements or other forcing factors. In addition, the ISO 14064-2 standard requires that the baseline selection shall be equivalent in type and level of activity between the project and the baseline scenario. This requirement is also known as functional equivalency.

The application of these requirements to the specific project evaluated in this assessment will be done with a project-specific approach, because no program-specific guidance is provided for the baseline selection for this project type. The temporal boundary is the same as the project lifetime, i.e. 100 years. The selection of the scenario that represents what would occur in the absence of the project following the stated guidelines requires the evaluation of several aspects, as described below.

3.1.1 End of Lifetime of the Current Infrastructure

In evaluating the lifetime of the current infrastructure, the City of Richmond engineering department has determined that the lifespan of the current dike and pump stations (given the appropriate maintenance) will be 100 years from the project start (Data Source: Interview, 17th of December 2018). Therefore, a structural failure of the current infrastructure within the project lifetime because it has reached the end of its life, is not the most probable, most conservative and viable scenario in the absence of the proposed project.

3.1.2 Doing Nothing

In June 2008, the City of Richmond adopted the 2008-2031 Flood Protection Strategy, which provides the framework for the proposed project. While, in and of itself the Strategy is not a regulation, it was developed in response to a number of regulatory and policy requirements for the City to act responsibly towards its citizens and provide adequate protection against flooding.

In a "doing nothing" scenario, the City of Richmond would not follow through with the actions and requirements of the Strategy or significantly delay its implementation. However in BC, the *Dike Maintenance Act* represents the regulatory enforcement instrument that governs dike construction and maintenance. An inspector of dikes under the *Dike Maintenance Act* can require the responsible authority, in this case the City of Richmond, "to repair, replace, renew, alter, add to, improve or remove a dike, or a part of a dike, or anything used in connection with a dike," (see section 2(2)(b) of the Dike Maintenance Act). It is therefore not unlikely that in a case of complacency on the part of the City of Richmond regarding its own Strategy at some

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point in time, an inspection of the dikes by an inspector will result in the requirement for the City to conduct some kind of upgrade or improvement to the dike and perhaps even to the pumps within the lifetime of the project infrastructure. Because of this assumption, the "doing nothing" scenario is not considered the most probable, most conservative and viable scenario in the absence of the proposed project.

3.1.3 Functional Equivalency

According to the BC Ministry of Environment's 2011 Climate Change Adaption Guidelines for Sea Dikes and Coastal Flood Hazard Land Use Sea Dike Guidelines, the current dike system is designed to a 1/200 years storm scenario (Designated Flood Level of 3.55 m) based on the 2010 Guidelines. As of 2011, the updated guidelines require a design consideration for a 1/500 years storm scenario (Designated Flood Level of 4.9 m) from 2100 onwards. The design requirements will change within the lifetime of the project infrastructure to a designated Flood Level of 4.9 m. A flood of this height would overflow the current dike that is only designed to the level of 3.55 m, mostly likely causing significant damage to the current dike infrastructure. To consider functional equivalency, it has to be assumed that the current dike is used to protect against a flood level of 4.9 m.

In this scenario, the dike would be damaged at some point within the lifetime of the project infrastructure. However the challenge would be determining the point at which this would happen within the lifetime, because the risk of having a 1/500 flood in any given year is the same.

3.1.4 Conservativeness

Considering all discoveries documented above, it must to be assumed that a flooding event or inspection will result into some kind of construction work being undertaken during the lifetime of the project in a business-as -usual scenario. The least conservative scenario would be that such repair work or upgrade work would be at least 100% equal to the project work or even greater. In such case, the project GHG emissions would be canceled out by the baseline emissions and would be zero or even exceeded, and the project would then have the impact of reducing GHG emissions.

However, none of those sections would be conservative and would risk the understatement of the related GHG emissions. The most conservative baseline scenario has to assume a storm event or an inspection that results in works that are similar in nature to the project work, but reduced in scope. Since the recommendation of future inspections are difficult to predict, the baseline selection will focus on a statistical storm event that will lead to partial destruction of the existing dike. Since the storm event will occur sometime between now and 100 years from now, it is assumed to happen half way in year 50 (i.e. 2069).

3.2 Construction

No new construction for neither, the dike nor the pump stations, will take place in the baseline scenario and therefore no GHG emissions are considered. However, the likelihood of a flooding

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event is assumed to be high during the lifespan of the assets, resulting in the destruction of 50% of the dike and requiring dike repair work at least by the year 2069.

	Amount	Unit	Source
Total material needed per meter of dike length	21.94	m^3	See assumptions
Density material	1940	kg/m^3	See assumptions
Total weight per m of dike	42.56	tonnes	
Meters of dike upgraded	2600	m	Provided by the City of Richmond

Table 3: Parameters of Dike Repair

3.2.1 Activity A - Transport of Material for Dike Repair

Table 4: Total GHG emissions from Activity A

	Amount	Unit	Source
Distance material yard to dike	30	km	Provided by the City of Richmond
15t Capacity Dump Truck Average Diesel use per km	0.77859	L/km	GHGenius
Emission factor Diesel Truck	2.63	$kgCO_2e/L$	B.C. Best Practices Methodology
Average Load (95% of dump truck capacity)	14.25	t	GHGenius
Number of trips total	7,766		
Total trucking distance total	465,959	km	
Total Diesel consumption	362,791	L	
Total GHG emissions Activity A	**954.14**	**tCO_2e**	

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3.2.2 Activity B – Repair Work of Dike

Table 5: Daily runtime hours and fuel efficiencies of construction equipment

	hours per day during construction	Fuel efficiency (L/h)	fuel consumption (L/day)	Source
Excavator	8	15	120	http://mcclung-logan.com/fuel-efficiency/fuel-efficiency-guide/
Backhoe	10	7.88	78.8	http://ictf-jpa.org/
Dump Truck	5	20.21	101.05	http://ictf-jpa.org/
Roller	4	28.41	113.64	http://ictf-jpa.org/

Table 6: Total emissions from dike repair work

	Amount	Unit
Meters of dike constructed per day	10	
Days of construction	260	
Emission factor Diesel Truck	2.63	kgCO2e/L
Emissions per day	1.087	tCO2e/day
Total emissions Activity B	**282.74**	**tCO2e**

3.3 Operation and Maintenance

Operation of the existing pumps is considered in the baseline scenario by using the average electricity consumption data from year 2010 until 2017. The emission factor for BC is assumed not to change within the project life time.

Table 7: Average yearly electricity consumption for pump operation from 2010 to 2017 in kWh

	Pumping power (HP)	Average yearly Electricity consumption from 2010 – 2017 (kWh)	Source
Station 1 - Ewen Rd	200	54,709.41	City or Richmond BC hydro data
Station 2 - No 6 Rd South	200	133,862.25	City or Richmond BC hydro data
Station 3 - McCallan Rd North	180		City or Richmond

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		37,523.87	BC hydro data
Station 4 - Dog Kennels	18.8	6,055.48	City or Richmond BC hydro data
Station 5 - Gilbert Rd & Steveston Hwy	64	23,287.33	City or Richmond BC hydro data
Total pumping power and yearly electricity use	**662.8**	**255,438**	

3.4 Baseline Emissions by Year

Table 8: Yearly net total baseline emissions during the lifespan of the assets

Year	Activity A (tCO2e)	Activity B (tCO2e)	Activity K (tCO2e)	Total net Baseline Emissions in tCO2e
2019	0.00	0.00	2.73	2.73
2020	0.00	0.00	2.73	2.73
2021	0.00	0.00	2.73	2.73
2022	0.00	0.00	2.73	2.73
2023	0.00	0.00	2.73	2.73
2024	0.00	0.00	2.73	2.73
2025	0.00	0.00	2.73	2.73
2026	0.00	0.00	2.73	2.73
2027	0.00	0.00	2.73	2.73
2028	0.00	0.00	2.73	2.73
2029	0.00	0.00	2.73	2.73
2030	**0.00**	**0.00**	**2.73**	**2.73**
2031	0.00	0.00	2.73	2.73
2032	0.00	0.00	2.73	2.73
2033	0.00	0.00	2.73	2.73
2034	0.00	0.00	2.73	2.73
2035-2068	0.00	0.00	2.73	2.73
2069	954.14	467.62	2.73	1,239.61

2070 - 2118	0.00	0.00	-	0.00
Total	**954.14**	**282.74**	**139.00**	**1,375.89**

4 Estimated Project Emissions

4.1 Construction Dike

Table 9: Parameters for dike upgrade

	Amount	unit	source
Total material needed per meter of dike length	50	m^3	Provided by the City of Richmond
Density material	1940	kg/m^3	See assumptions
Total weight per m of dike	97	tonnes	
Meters of dike upgraded	2600	m	Provided by the City of Richmond

4.1.1 Activity C - Transport of Material for Dike Upgrade

Table 10: Total GHG emissions from Activity C

	Amount	Unit	Source
Distance material source - dike	30	km	Provided by the City of Richmond
15t Capacity Dump Truck Average Diesel use per km	0.77859	L/km	GHGenius
Emission factor Diesel Truck	2.63	$kgCO_2e/L$	B.C. Best Practices Methodology
Average Load (95% of dump truck capacity)	14.25	t	GHGenius
Number of trips total	17,698.25		
Total trucking distance total	1,061,894.74	km	
Total Diesel consumption	826,780.62	L	
Total GHG emissions Activity C	**2,174.43**	**tCO_2e**	

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4.1.2 Activity D – Construction of Dike

Table 11: Daily runtime hours and fuel efficiencies of construction equipment

	hours per day during construction	Fuel efficiency (L/h)	fuel consumption (L/day)	Source
Excavator	8	15	120	http://mcclung-logan.com/fuel-efficiency/fuel-efficiency-guide/
Backhoe	10	7.88	78.8	http://ictf-jpa.org/
Dump Truck	5	20.21	101.05	http://ictf-jpa.org/
Roller	4	28.41	113.64	http://ictf-jpa.org/

Table 12: Total GHG emissions from dike construction

	Amount	Unit
Total Diesel consumption per day	413.49	L/day
Days of construction	260	days
Emission Factor Diesel	2.63	$kgCO_2e/L$
Emissions per day	1.087	tCO_2e/day
Total emissions Activity D	**282.74**	**tCO_2e**

4.1.3 Activity E – Road Realignment

Table 13: Total GHG emissions from Activity E

	Amount	Unit	Source
Total material needed per meter of road length	40	m^3	Provided by the City of Richmond
Density material	2243	kg/m^3	See assumptions
Distance material yard to dike	30	km	Provided by the City of Richmond
15t Capacity Dump Truck Average Diesel use per km	0.77859	L/km	GHGenius
Emission factor Diesel Truck	2.63	$kgCO_2e/L$	B.C. Best Practices Methodology

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Average Load (95% of dump truck capacity)	14.25	t	GHGenius
Number of trips total	16,370		
Total trucking distance total	982,198	km	
Total Diesel consumption	764,729	L	
Total GHG emissions material transport	2,011.24	tCO_2e	
Total diesel consumption construction equipment	113.64	L/day	
Construction emissions per day	0.299	tCO_2e	
Days of construction	26		
Total emissions road construction	77.71	tCO_2e	
Total emissions Activity E	2,088.95	tCO_2e	

4.2 Construction Pump Stations

4.2.1 Activity G – Demolition of Old Pump Houses and Waste Transport

Table 14: Machinery details for demolition of pump houses and kiosks

Machinery - Pump Stations Demolition	Demolition hours total	Fuel efficiency (L/h)	fuel consumption (L)	Source to Demolition Hours
Excavator	13	15	188.14	https://www.methvin.org/construction-production-rates/demolition-renovation/demolishing-concrete

Table 15: Total GHG emissions from Activity G

	Amount	Unit	Source
Demolished Material - Pump Station Buildings	99,800	tonnes	See assumptions
Demolished Material – Pump Station Kiosks	30,600	tonnes	See assumptions

Total amount of demolition waste material	360,600	tonnes	
Distance demolition site to waste yard	15	km	Provided by the City of Richmond
15t Capacity Dump Truck Average Diesel use per km	0.77859	L/km	GHGenius
Emission factor Diesel Truck	2.63	kgCO2e/l	B.C. Best Practices Methodology
Average Load (95% of dump truck capacity) in t	14.25	t	
Number of trips	25,305.26		
Total trucking distance (including return)	759,157.89	km	
Total Diesel consumption	591,072.75	L	
Total GHG emissions transport waste material	1,554.52	tCO2e	
Total GHG emissions demolition machinery	0.495	tCO2e	
Total GHG emissions Activity G	**1,555.02**	**tCO2e**	

4.2.2 Activity H - Transport of Construction Material for Pump Stations

Table 16: Construction details and dimensions of new pump stations

	Amount	Unit	Source
Concrete needed per pump house	32.5	m^3	See assumptions
Concrete needed per Kiosk	15.3	m^3	See assumptions
Number of new pump houses	3		Provided by the City of Richmond
Number of new Kiosks	2		Provided by the City of Richmond
Total amount concrete needed	128.1	m^3	
Concrete Density	2000	Kg/m^3	CSA A165.1 Standard

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Concrete	265,200	tonnes	
Masonry brick needs per pump house	17.4	m^3	See assumptions
Masonry brick density	2000	Kg/m^3	CSA A165.1 Standard cited in Brampton Brick
Total Masonry weight	104400	tonnes	
Total Material needed	**360,600**	**tonnes**	

Table 17: Total GHG emissions Activity H

	Amount	Unit	Source
Total amount of building material needed	360,600	tonnes	
Distance material source	30	km	Provided by the City of Richmond
15t Capacity Dump Truck Average Diesel use per km	0.77859	L/km	GHGenius
Emission factor Diesel Truck	2.63	kgCO2e/L	B.C. Best Practices Methodology
Average Load (95% of dump truck capacity) in t	14.25	t	
Number of trips	25,305		
Total trucking distance (including return)	1,518,315	km	
Total Diesel consumption	1,182,145	L	
Total GHG emissions Activity H	3,109.04	tCO2e	

4.2.3 Activity I - Construction of Pump Houses

Table 18: Total GHG emissions Activity I

	Amount	Unit	Source
Placing concrete, lorry based pump	30	m^3/h	Mehtvin
Concrete Building Type Pump Station	97.5	m^3	
Concrete - Kiosk Pump Station	30.6	m^3	

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Total of Concrete Placed	128.1	m^3	
Machinery work hours	4.27	hours	
Fuel efficiency concrete pump	15	L/h	
Fuel consumption total	64.05	L	
Emission factor Diesel	2.63	$kgCO_2e/L$	B.C. Best Practices Methodology
Total emissions Activity I	0.168	tCO_2e	

4.2.4 Activity J - Dewatering and Bypass

Table 19: Total GHG emissions Activity H

Dewatering pumping power	Pumping power (HP)	Pumping power (kW)	Total kWh dewatering	GHG emissions in tCO2e
Station 1 - Ewen Rd	60	45	32,751	0.35
Station 2 - No 6 rd south	84	63	45,852	0.49
Station 3 - McCallan Rd North	60	45	32,751	0.35
Station 4 - Dog Kennels	9.4	7	5,131	0.05
Station 5 - Gilbert Rd&Steveston Hwy	32	24	17,467	0.19
Total GHG emissions Activity H				**1.43**

4.3 Operation of Pumps

4.3.1 Activity K – Operation of Pumps

Table 20: Total yearly emissions from Activity K

Operation & Maintenance				
BC Hydro Electricity	10.67	tCO2e/GWh		

Emission Factor				
	Planned Pumping power (HP)	Increase in %	Projected yearly electricity use in kWh	Projected yearly ghg emissions in tCO2e
Station 1 - Ewen Rd	381	91%	104,221	1.11
Station 2 - No 6 Rd South	381	91%	255,007	2.72
Station 3 - McCallan Rd North	381	112%	79,425	0.85
Station 4 - Dog Kennels	111	490%	35,753	0.38
Station 5 - Gilbert Rd & Steveston Hwy	111	73%	40,388	0.43
Total	**1365**	**1.06**	**514,796**	**5.49**

4.4 Project Emissions by Year

Table 21: Project Scenario Emissions per year

Year	Activity C (tCO2e)	Activity D (tCO2e)	Activity E (tCO2e)	Activity G (tCO2e)	Activity H (tCO2e)	Activity I (tCO2e)	Activity J (tCO2e)	Activity K (tCO2e)	Total Project emissions in tCO2e
2019	0	0	0	0	0	0	0	2.73	2.73
2020	0	0	0	0	0	0	0	2.73	2.73
2021	0	0	0	622.01	1243.62	0.07	0.24	3.22	1869.16
2022	1087.22	141.37	1044.47	311.00	621.81	0.03	0.49	4.52	3210.91
2023	1087.22	141.37	1044.47	622.01	1243.62	0.07	0.70	5.49	4144.94
2024	0	0	0	0	0	0	0	5.49	5.49
2025									

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	0	0	0	0	0	0	0	5.49	5.49
2026	0	0	0	0	0	0	0	5.49	5.49
2027	0	0	0	0	0	0	0	5.49	5.49
2028	0	0	0	0	0	0	0	5.49	5.49
2029	0	0	0	0	0	0	0	5.49	5.49
2030	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5.49**	**5.49**
2031	0	0	0	0	0	0	0	5.49	5.49
2032	0	0	0	0	0	0	0	5.49	5.49
2033	0	0	0	0	0	0	0	5.49	5.49
2034	0	0	0	0	0	0	0	5.49	5.49
2035 - 2069	0	0	0	0	0	0	0	5.49	5.49
2069 - 2118	0	0	0	0	0	0	0	0	0
Total	**2,174.43**	**282.74**	**2,088.95**	**1,555.02**	**3,109.04**	**0.17**	**1.43**	**271.36**	**9,483.14**

5 Estimated Net Increase or Reduction in Emissions

Table 22: Net change in GHG emissions

Year	Total net baseline emissions in tCO2e	Total Project emissions in tCO2e	Total net change in emissions in tCO2e
2019	2.73	2.73	0.00
2020	2.73	2.73	0.00
2021	2.73	1,869.16	1,866.43
2022	2.73	3,210.91	3,208.19
2023	2.73	4,144.94	4,142.22
2024	2.73	5.49	2.77
2025	2.73	5.49	2.77
2026	2.73	5.49	2.77
2027	2.73	5.49	2.77
2028	2.73	5.49	2.77
2029	2.73	5.49	2.77
2030	**2.73**	**5.49**	**2.77**
2031	2.73	5.49	2.77
2032	2.73	5.49	2.77
2033	2.73	5.49	2.77
2034	2.73	5.49	2.77
2035	2.73	5.49	2.77
2036 - 2068	2.73	5.49	2.77
2069	1,239.61	5.49	-1,234.12
2070 - 2118	0.00	0.00	0.00
Total	**1,375.89**	**9,483.14**	**8,107.25**

6 Other Potential Mitigation Measures (optional)

6.1 Options for avoidance of impacts

6.2 Options for mitigation of impacts

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7 Conclusion

This GHG emissions analysis was conducted according to Climate Lens Guidelines and aligns with the relevant assessment standard, i.e., ISO 14064-2 and the GHG Protocol for Project Accounting.

The total GHG emissions of the most likely functionally baseline scenario over the lifespan of the assets were identified to be 1,375.89 tCO2e, of which 954.14 tCO2e are related to the transport of dike repair material, 282.74 tCO2e to the repair work of the dike in 50 years from now, and 139.00 tCO2e are related to the operation of the drainage pumps with yearly emissions of 2.73 tCO2e until the end of their lifespan in year 2069.

The total GHG emissions from the project scenario were identified to be 9,483.14 tCO2e, of which 2,174.43 tCO2e and 282.74 tCO2e are related to the dike construction material transport and the construction work, respectively. 2,088.95 tCO2e are related to road realignment and 1,555.02 tCO2e, 3,109.04 tCO2e, and 0.17 to demolition of old pump houses, pumphouse construction material transport, and pump station construction, respectively. The dewatering for implementation of the new pumps resulted in 1.43 tCO2e and the operation of the pumps in 271.36 tCO2e total with yearly emissions of 5.49 tCO2e until the end of their lifespan in year 2069.

A total of 8,107.25 tCO2e was identified as the net resulting GHG emissions from the proposed new infrastructure over the lifespan of the assets by calculating the difference between the emissions of a most likely functionally equal baseline scenario and the emissions of the project scenario.

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Canada's National Inventory Report

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GHGenius

GHGenius is a free to download lifecycle analysis (LCA) model with a primary focus on transportation fuels in Canada.

www.ghgenius.ca/

Methvin Estimating Software

Methvin is a project management and estimation tool designed for the construction industry. It will make your life considerably easier; estimating projects, publishing tenders and producing comparisons, and helping to find potential business opportunities.

www.methvin.org/

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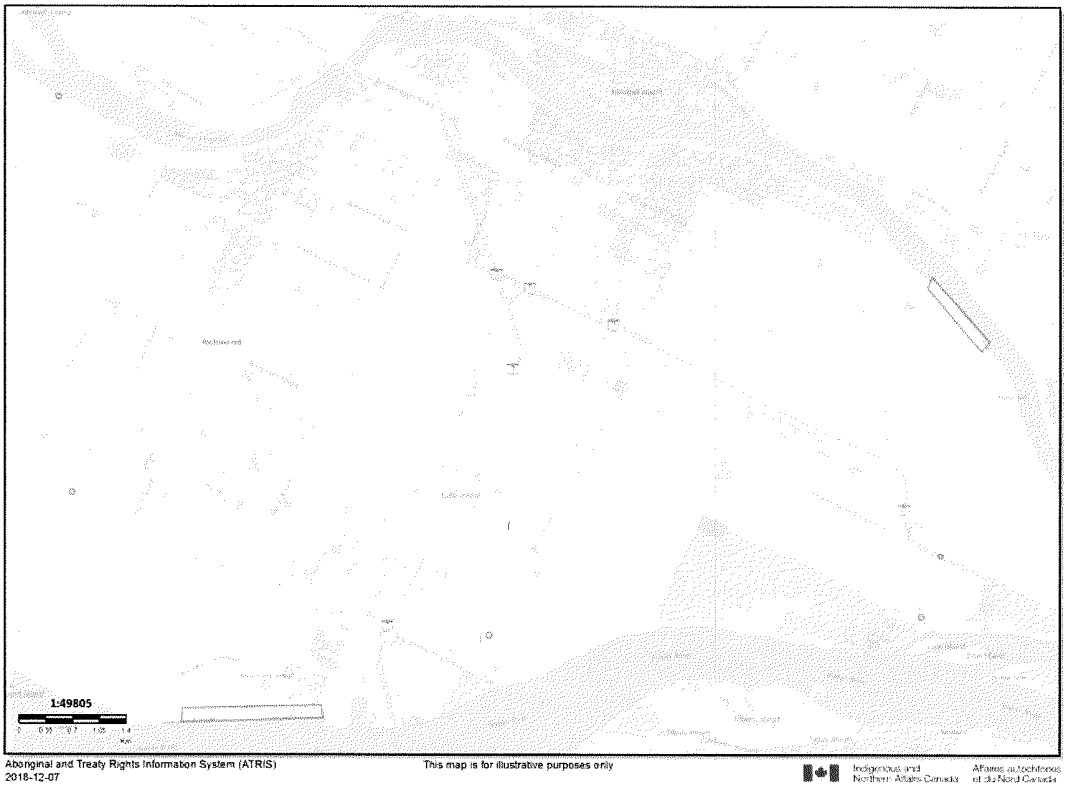
9 Annex

9.1 Annex 1 – Map of the proposed project sites

Annex I - RFPP



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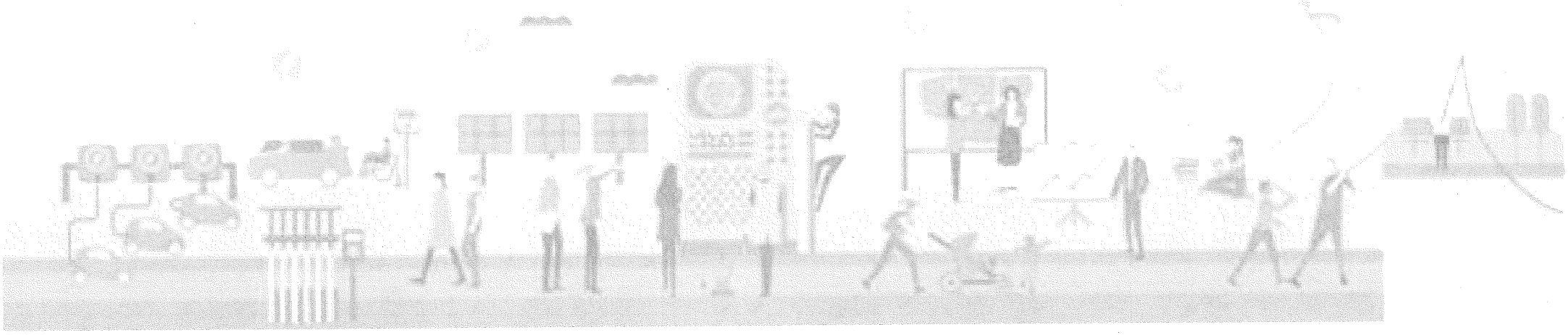
City of Richmond

Smart City Challenge Proposal Support

Draft & Confidential



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Outline

1.0 Context

1.1 Background Information & Inputs
1.2 Vision
1.3 Operational Model
1.4 EOC Business Use Themes

2.0 Physical Considerations

2.1 Consoles & Desks
2.2 Video Wall
2.3 Other Considerations

3.0 Virtual Considerations

4.0 Site Options & Costs

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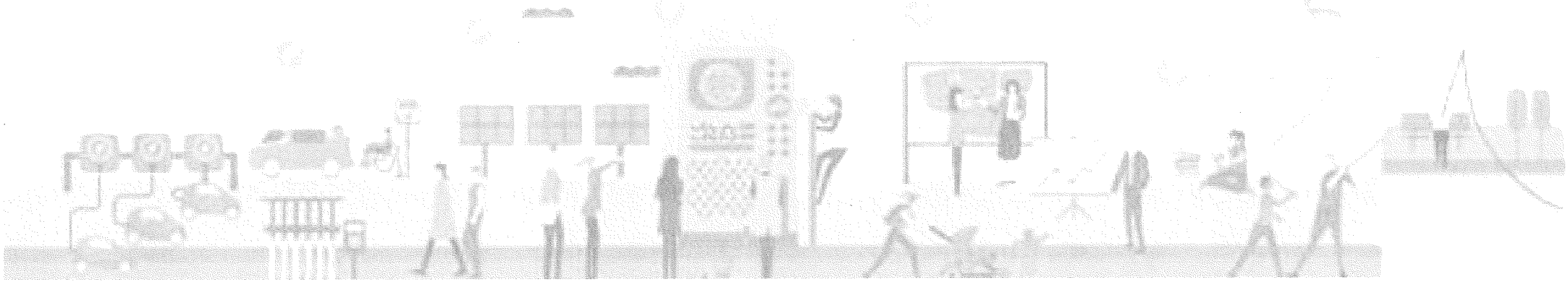
1.0 Context



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Background Information & Inputs

- *Smart City Challenge Submission*
- *City Input (through meetings and teleconferences) on physical and virtual objectives Hub*
  - *Create an everyday operation centre to manage City operations and integrate cross functional data collected to seamlessly transition to an emergency operation centre*
  - *Create a well-designed and functional physical setting for operations HUB; Work with partners such as E-Comm, BC Ambulance, TransLink, RCMP, The Port of Vancouver, Musqueam Indian Band and Vancouver International Airport, to ensure communication processes and protocols are in place and integrated;*
  - *Integrate all data collection points to the Municipal Operations HUB*
  - *Create a mobile application/dashboard to ensure decisions can be made offsite when needed.*
- *Supporting IT documentation on architecture and data flows*
- *Responses to IBI survey on uses of Hub*
  - *Corporate Communications*
  - *Public Works*
  - *Transportation*
  - *Emergency Services*

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Vision (Options)

*Establish an **Integrated Municipal Operations Hub** that minimizes physical requirements by leveraging advanced technologies and virtual capabilities enabling optimum day to day city operations, external coordination, and data exchange, while seamlessly transitioning to emergency operations as needed.*

*Establish a highly resilient **Municipal Operations Hub** that leverages advanced technologies and virtual capabilities to optimize day to day city operations, external coordination, and data exchange, and which can seamlessly transition to an expanded emergency operations centre as needed.*

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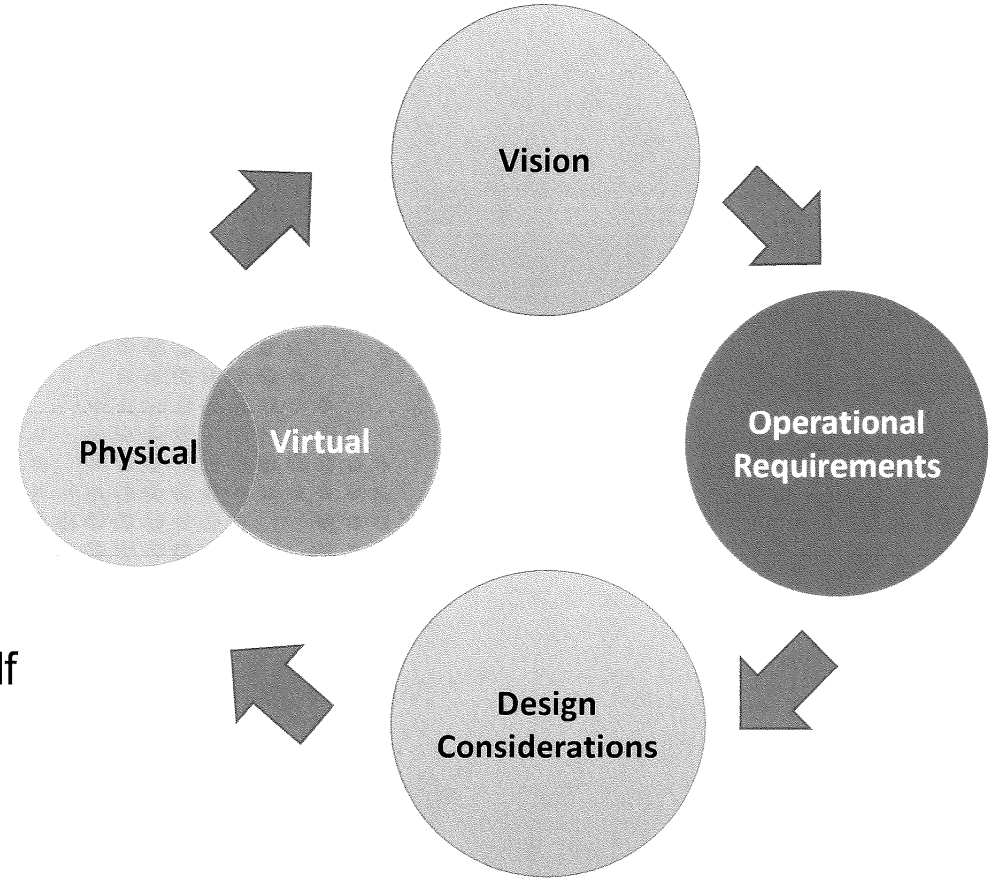
Operational Model

- Day to day operating units, functions, procedures
- Supporting degree of coordination between units and functions
- Internal escalation procedures, decision making structure, chain of command
- Role of participating external agencies: observer/data exchange or contribute to decision making
- Systems reliance
- Max duration that centre should sustain itself for in an emergency
- Separation of location of systems and people



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EOC Business Use Themes

Each EOC is unique. The design of the Richmond Smart City EOC is based on the City's operational vision.

- Flexibility to accommodate Everyday Operations and Emergency Operations to improve safety and security
- Leverage technology for optimal presentation of coordinated smart alerts, and systems for emergency detection/assessment
- Facilitate communications and data sharing with partners, e.g., E-Comm, BC Ambulance, TransLink, RCMP, The Port of Vancouver, Musqueam Indian Band and Vancouver International Airport
- Support MyRichmond city services information flows

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2.0 Physical Considerations

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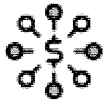
Benefits of Co-location

Enhanced operational effectiveness	
	Stronger working relationships and improved work cohesion among teams, through **direct and immediate communications** and in-person interactions among related functions, enabled by closer physical proximity
Faster, direct and **simultaneous access to common information**, expediting operations and improving accuracy (e.g., fewer errors associated with multiple transfers of information)	
	Awareness of other teams' roles and responsibilities, leading to adaptation of work styles to facilitate operations
Strengthening of informal networks among co-workers resulting in improved workflow communications and situational awareness	
	Increased opportunities for information exchange through technology (e.g., audio-visual displays showing operations status)
Support of opportunities for **cross-training**	
Cost savings, cost efficiencies and economies of scale	
	**Sharing** computer/communications systems, audio-visual technology, staff amenities, common space, etc.

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EOC Operations Room

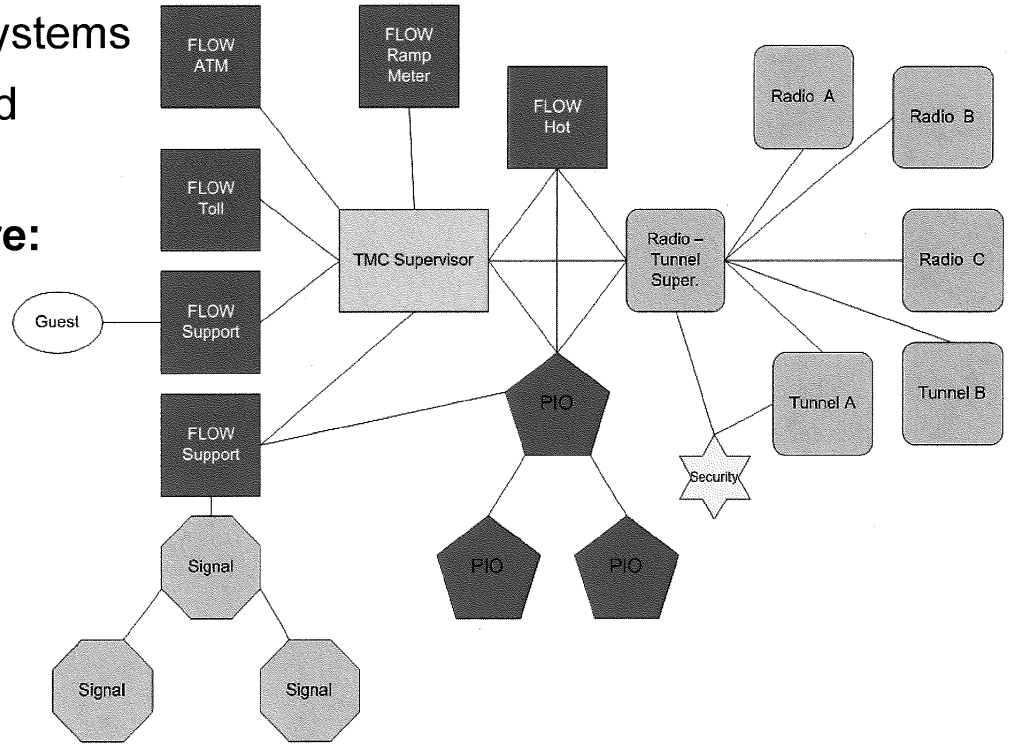
Interactions and Ergonomics

Business use requirements drive the EOC Operations Room design:

- Visual/verbal/electronics interaction between operations staff
- Verbal/visual needs of supervisors
- Interactions between staff and equipment/systems
- Information exchange with other internal and external staff/ agencies

The main determinants of physical design are:

- Consoles/desks
- Video wall
- Ergonomics: layout concept, sight lines, lighting, noise, HVAC, floor levels
- Other: power, UPS/generator connectivity, security, speakers



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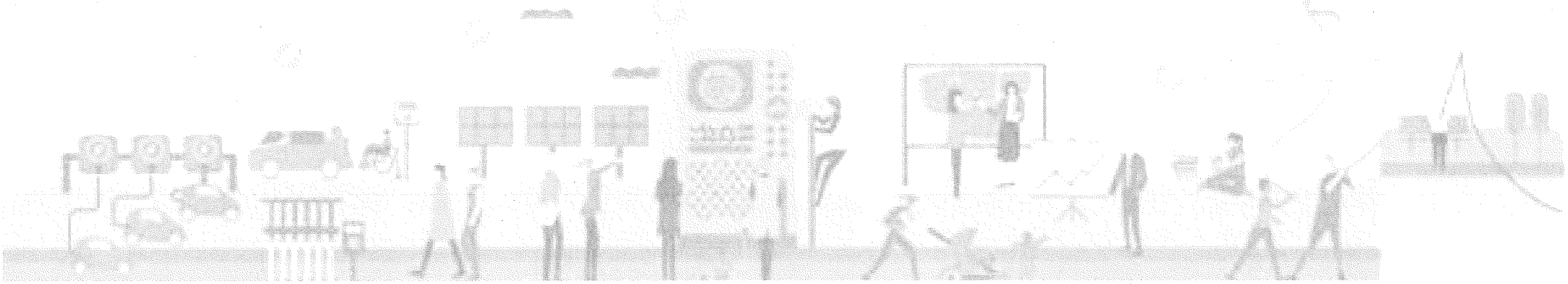
2.1 Consoles & Desks



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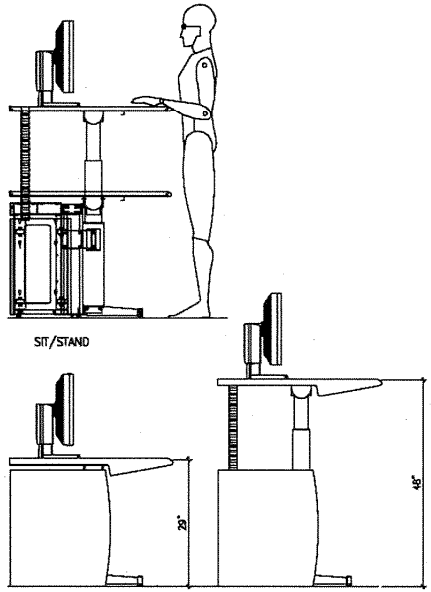
Operations Consoles/Desks

The Control Room space is best designed by building up from its component elements, starting with desks/ consoles, which tend to be large and high-cost items.

Consoles have unique features that differ from regular office desks.

- Intensive amounts of electronic equipment and cable organization
- 24/7 robust
- Long hours for surveillance, response, etc. requires attention to physical ergonomics



Console Features

- **Size**
  - Accommodates all monitors, phones, radios, other
  - Clear space for referencing documents, hard notes
- **Sit/Stand Design**
- **Shape**
  - Linear, L-shaped or U-shaped (preferred)
- **Monitor Arms**
  - Flexible
  - Articulated

- **CPU and Cable Management**
  - Non-obstructing
  - Flexible
  - Accessible
  - Remote placement (space savings vs. robustness)
- **Task Lighting**
- **Extra Storage**

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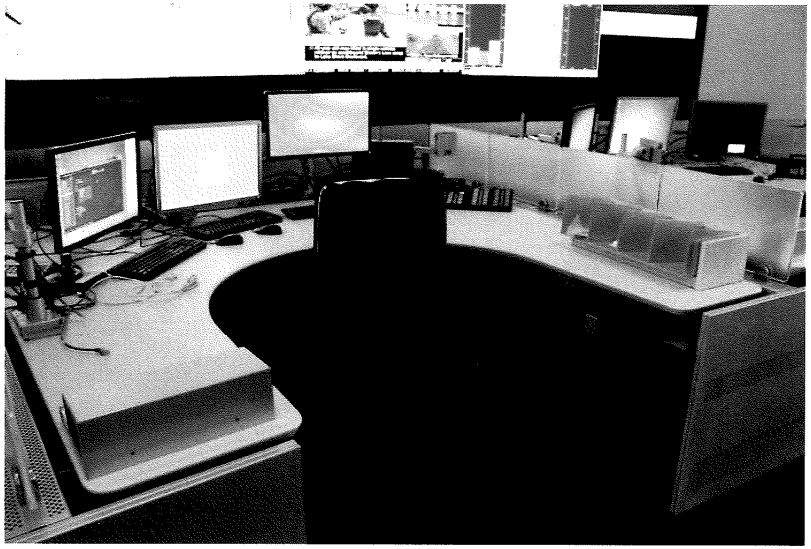
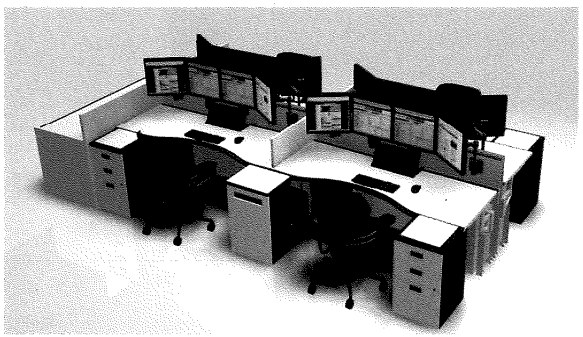
Shape of Operations Console/Desk

- U shaped consoles well-liked by operations staff
- Also known as “wrap-around” or “cockpit” shape
- Operators can easily access all of their applications
- Cons: large footprint, more complex sit-stand mechanism, usually more costly

▼ U-Shaped



▼ Console/desk can approximate a curve through a surface indent with side pedestals (stacks of drawers) where space is not available for a true U-shaped console



▼ L-Shaped

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2.2 Video Wall

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Video Wall

A Video Wall is typically used to:

1. Provide real-time monitoring of network;
2. Present both global and local views, including emergency areas, to optimize recovery;
3. Aid the proactive planning of events affecting City services; and
4. Quickly disseminate information across staff teams to ensure common alignment in incident/emergency response.

Video wall usage:

- Constant surveillance → Seated directly in front of display content, close attention to scaled size (to address human factors legibility)
- Scan and react → Seated with video wall in front view, similar to driver scanning car mirrors
- Pro-active reference → Video wall in same room, seating does not have to face the wall

EOC spatial layout affected by video wall:

- Use
- Size
- Content and audience

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Video Wall Typical Content

Primary display for monitoring city systems, smart alerts and active events.
Typical Smart City EOC content includes:

- CCTV video feeds (e.g., streets, security)
- Entire City map. Layers superimposed to show relative effects, e.g.:
  - Smart Streets data and incident detection locations
  - "Points of interest" e.g., planned event sites, high safety risk locations
  - Smart alert locations
  - Weather forecasts
  - Areas affected by earthquakes, flooding, weather
  - Roadworks/closures locations
- Dashboards showing system status
- Data from other Smart City systems
- Data from partner agencies
- Network health summary
- Feeds to MyRichmond
- Cable TV feeds
- Twitter/social media
- Whiteboard messages (shown as display)

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Video Wall Typical Content

Goal	Industry Best Practices
Improve Situational Awareness	• Displaying end to end system overview map (e.g., for Smart Streets) • Use of map-based layering/overlays to bring together different events, incidents, equipment issues, earthquake/flooding impact areas, etc. on the same map • Sequential progression and consistent location of CCTV camera outputs to facilitate quick references
Inform and Expedite Decision-Making	• Displaying dashboard and system status summaries to provide management overview information and to help operations staff to make quick and effective decisions • Visual distinction and conspicuity of conditions/situations that are out of the ordinary, e.g., using colours, framing, etc. • Tailoring templates for different situations, to optimize video wall real estate
Promote Efficiency Through Common Understanding	• Use of the video wall as a collaborative tool and dealing with specific details at the individual console level • Allocating large central screens for general room-wide information • Posting general reference information, e.g., twitter feeds, news, weather, virtual white board (e.g., bulletin board for general employee information such as who is on duty, etc.)
Facilitate Individual Business Processes	• Displaying interactive applications on console monitors and non-interactive applications on video walls • Locating information specific to a role or group directly within their primary ergonomic viewing zone
Streamline and Simplify Operations	• Reduction of multiple displays at each console and sharing among users on the video wall, which reduces individual operator overload and improves operational efficiency

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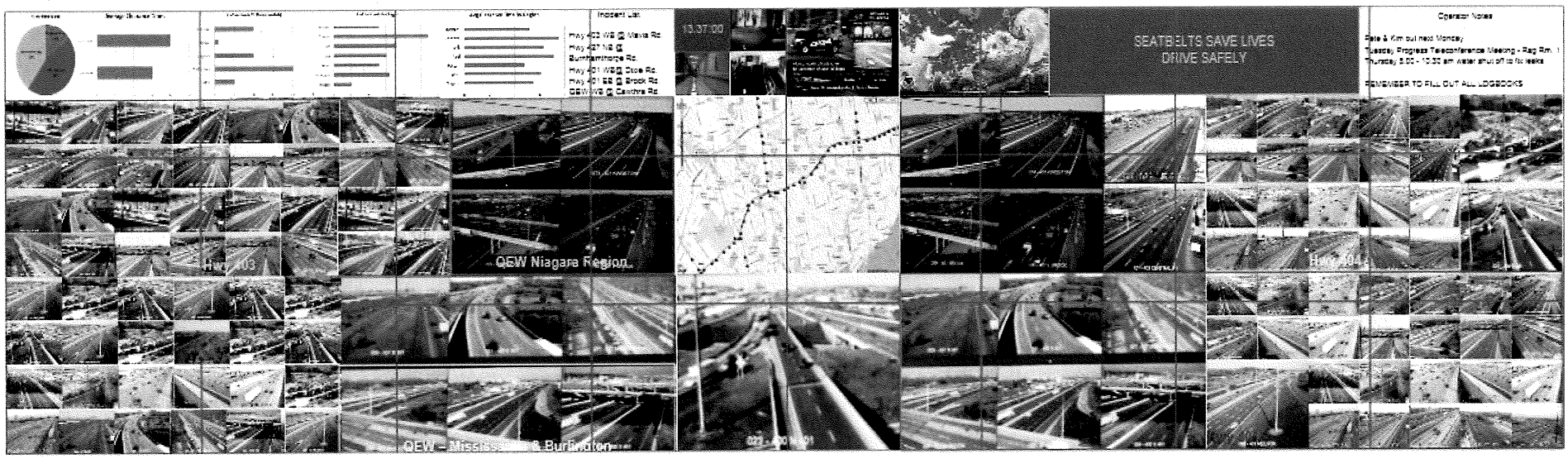
Design Principles for Video Wall Layout

Display high priority content, i.e., high importance to NOC business processes, shared by many, minimal user interaction	Place business unit content within ergonomic viewing ranges of specific users	Place common content so it is visible to all users, repeating content if necessary	Add framing to differentiate blocks of content for easy reference	Where feasible, place common content symmetrically on opposite sides of VW	Place content consistently for different video scenarios and templates to facilitate finding information



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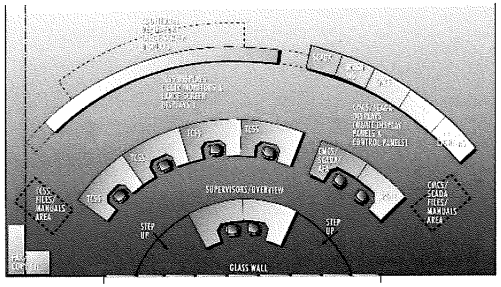
Seating Style

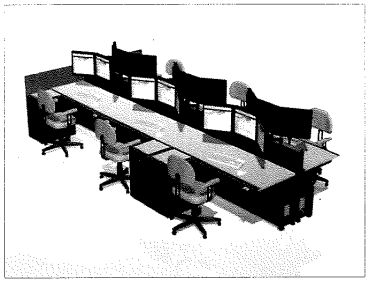
Options:

1. Concentric
2. Rows
3. Zones
4. Pods

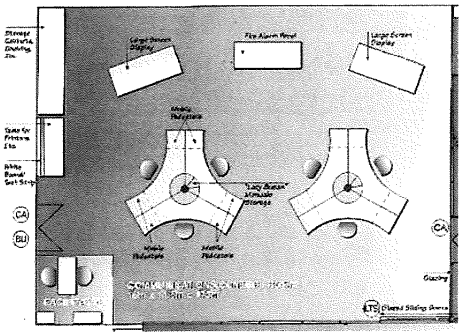
1 Concentric

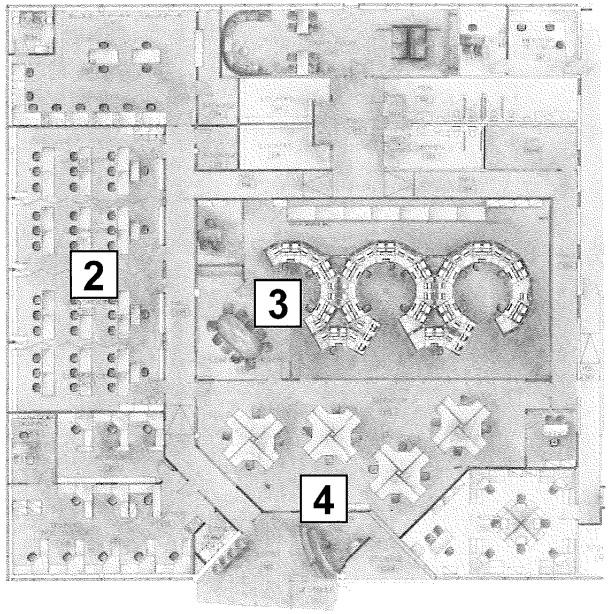


2 Rows



4 Pods





- Very wide rows may limit view of display wall, depending on size of wall, combined width of consoles, etc.
- Curving the rows (left image) can mitigate this limitation
- Zones or pods may require some operations staff to turn their heads to view video wall
- Pods provide more privacy/independence
- Zones are good for close interactions
- Rows take up the least space

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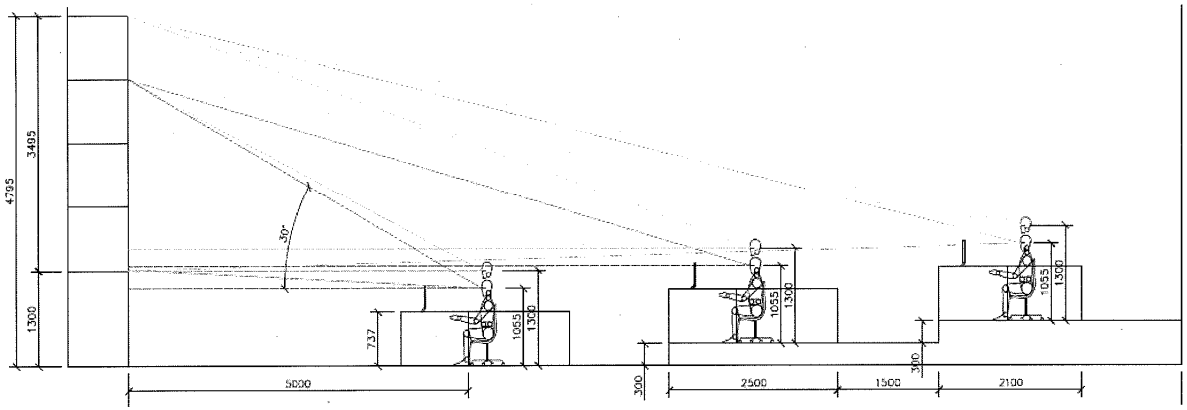
Sightlines

Sightline and viewing considerations determine the placement of the video wall, operations consoles/desks and desktop equipment:

- Ergonomic viewing distance based on video wall display resolution.
- Usage of video wall determines sightline requirements and seating plan (i.e., constant surveillance, scan/react, or pro-active reference) .
- Stepped floor elevations may support video wall usage.
- Maximum ergonomic head tile angle is 30 degrees.
- Maximum horizontal head rotation is 45 degrees to the left and right of straight ahead.
- Desktop equipment must not block video wall views needed for business functions



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Vertical Viewing Angle Analysis Example

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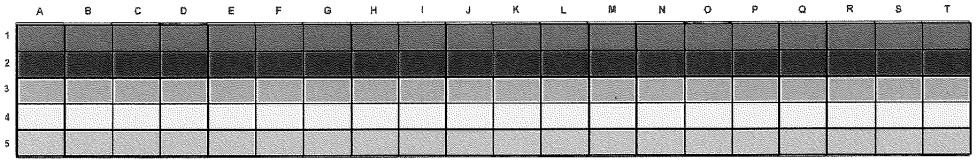
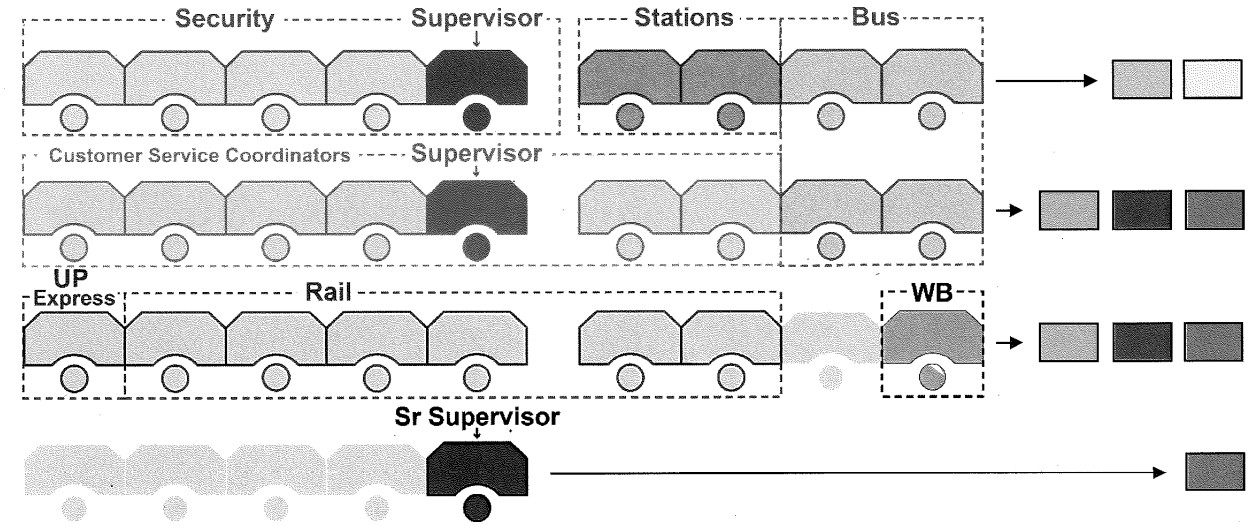
Elevation



Basic vertical and horizontal ergonomic viewing angles were used to determine the areas of the video wall that can be readily seen from each desk

Plan



The front row of users can readily view the bottom 2 rows of video wall monitors, which cannot be easily viewed from the other rows.

The 2nd and 3rd row of users can readily view the top 3 rows of video wall monitors, which cannot be easily viewed from the front row.

The back row of users can readily view the top row of video wall monitors.

As the distance from the wall increases, text and image legibility decreases.

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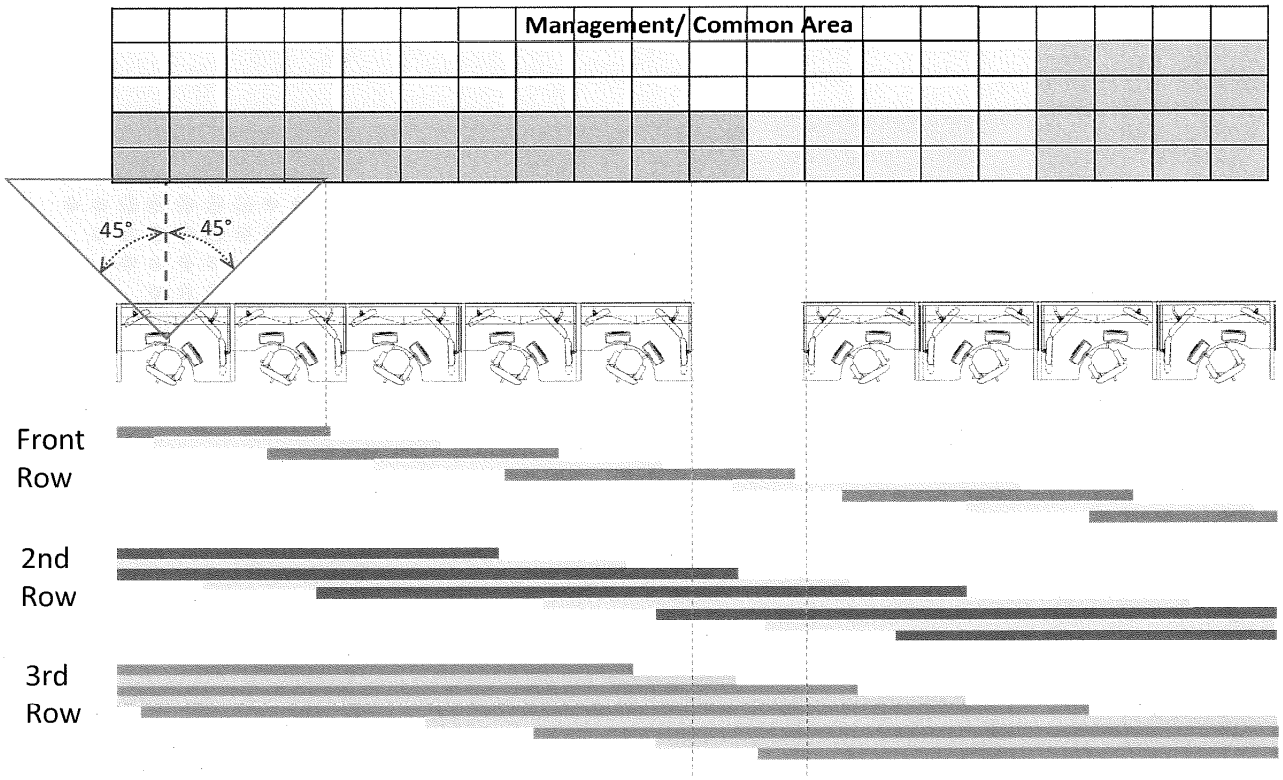
Horizontal Viewing Analysis Example



- The seating plan, together with ergonomic vertical viewing angles, were used to assign viewing area blocks to each Business Unit
- Horizontal viewing angles (45 degrees to the left and right of straight ahead) were used to position the content within each viewing area block
- The ergonomic horizontal viewing range is represented for each desk in a given row, from left to right, by the coloured stripes drawn below each desk
- The centre part of the video wall is within the ergonomic horizontal viewing range of less than half of the users
- Common use content needs to be repeated across the video wall to fall within the ergonomic horizontal viewing range of all users (while seated at their desks)

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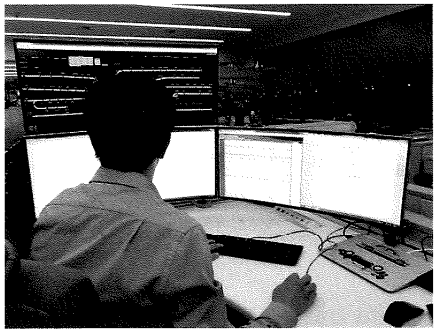
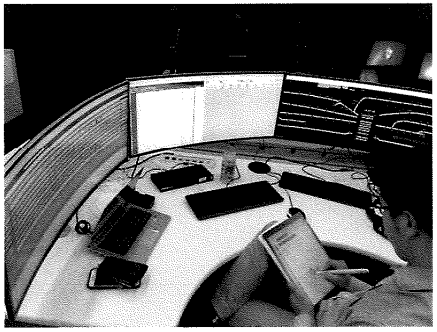
Desktop Equipment View Impact Analysis Example

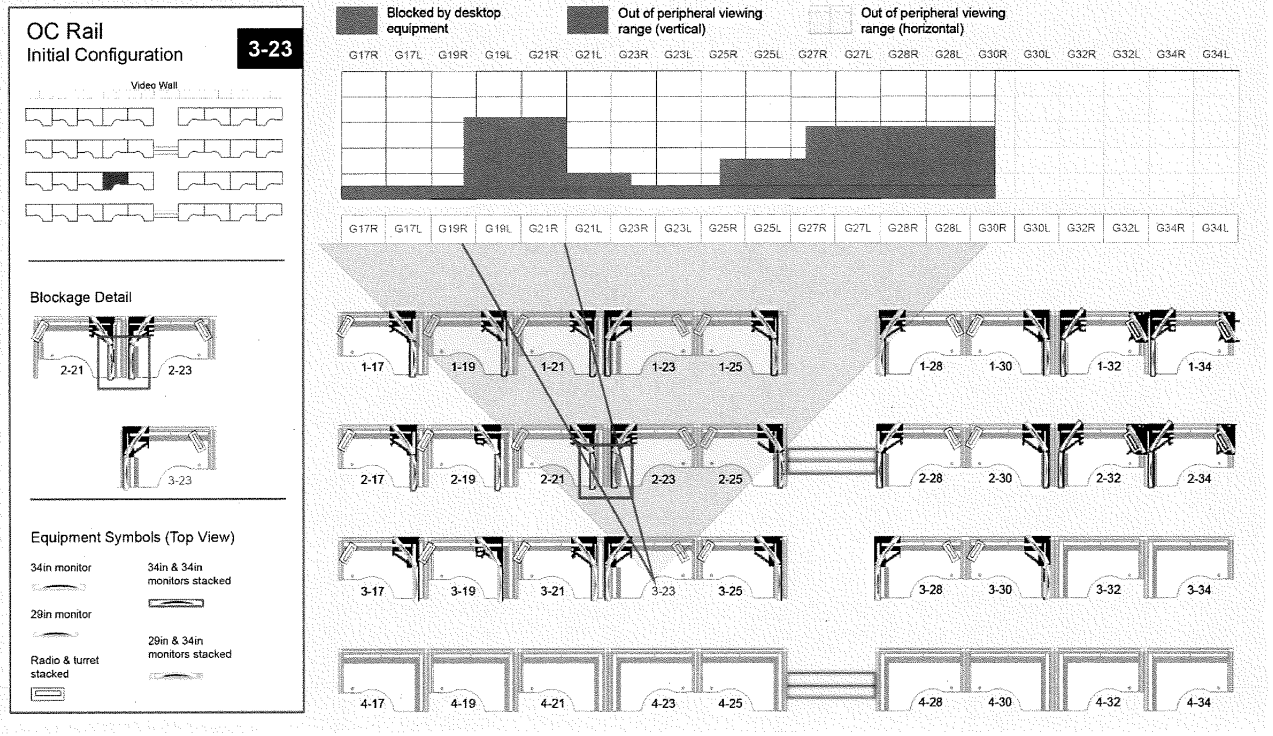
▼ Stacked



▼ Wrapped



Equipment on other consoles/desks affects viewing.



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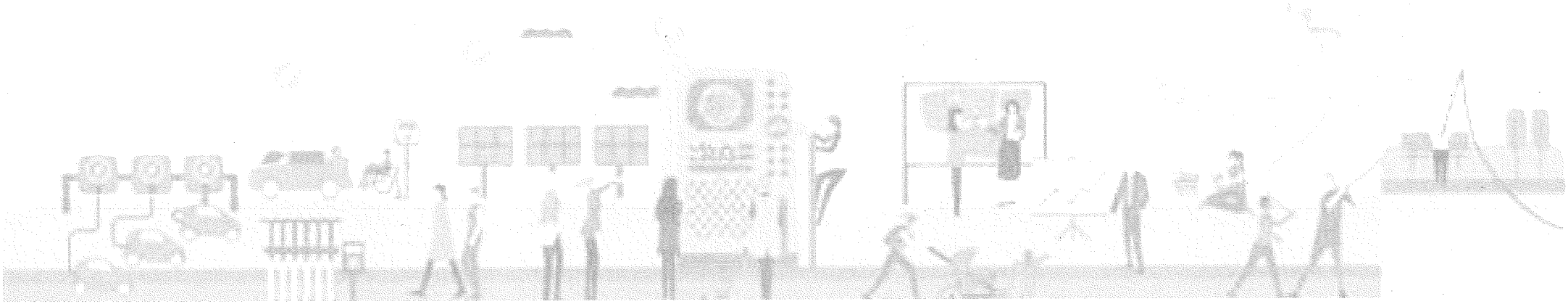
2.3 Other Considerations



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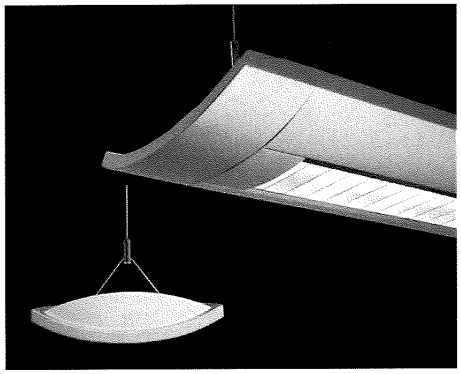
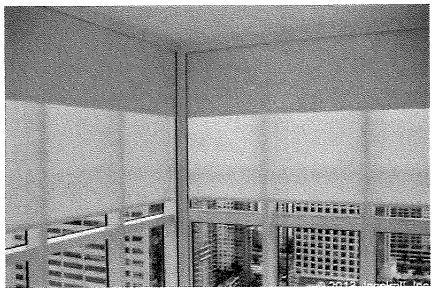
Lighting

- Reduced levels for viewing electronic displays
- Sufficient brightness for reading and desk tasks
- Combination: indirect LED, pot-lights, wall-washers, dimmable, zone control
- Glare avoidance
- Task lighting at desks
- Natural light for health, partial sunblock blinds
- Daylight harvesting system

Humanscale



Insolroll



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Noise Mitigation

- Tackled through sources and transmission medium
- Hand free wireless headsets
- Operators in close verbal proximity
- Soft materials for floor, wall/ceiling (acoustic panels), console, surfaces, irregular surfaces (e.g., exposed ceilings, baffling, “clouds”
- Slab-to-slab floor-to-ceiling construction

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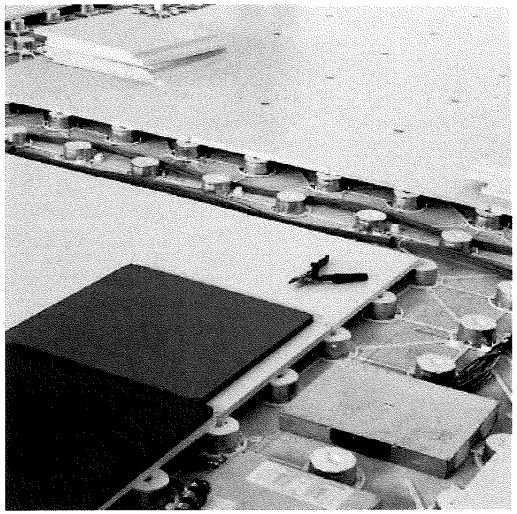
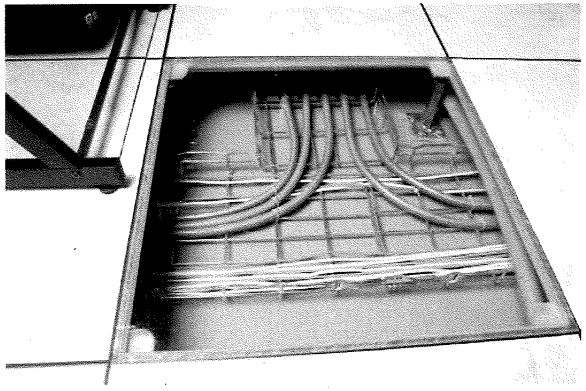
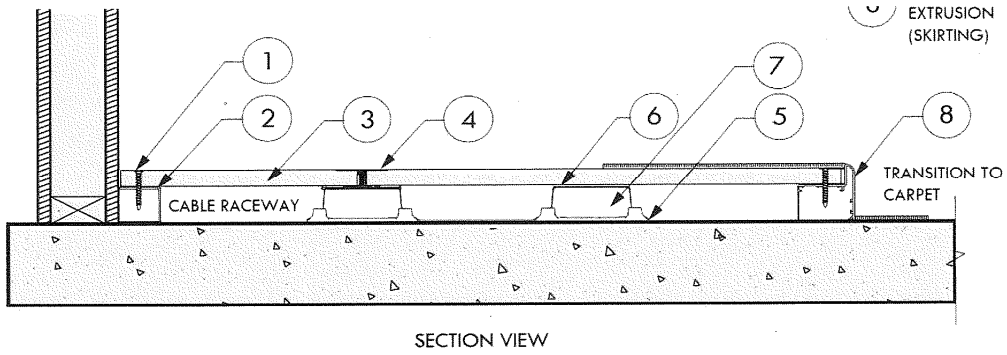
Cable Routing

Cabling from server room

- Options:
  - Raised/lowered floor
  - Ceiling space of the floor below
  - Through walls
- Shallow depth products available







SECTION VIEW

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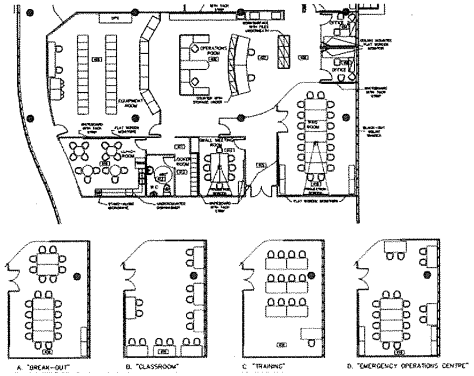
Support and Ancillary Space Needs

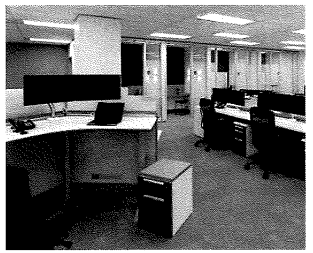
EOC Support Space

- Situation Room for transitioning from Everyday mode to Emergency mode
- Often functions as a multi-purpose room (training, visitors, meetings)
- Server Room for server racks, UPS, batteries
- Communications Room for head-end terminations
- Meeting Rooms, Break-out Rooms, Conference Rooms
- Outdoor Generator



EOC Ancillary Space

- Offices – open and closed
- Testing areas
- Plotter/Printer Room
- Storage Rooms – electronics and general storage
- Kitchen/Lunchroom
- Break Room / Quiet Room – for time out from intensive operations
- Washrooms / Showers
- Lockers – for staff working at shared consoles/desks
- Parking



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Security

External to Building (CPTED principles)

- Anonymize exterior
- Disrupt & reduce at-grade vehicle approach
- Continuous visual surveillance, overlapped viewscapes
- Eliminate visibility of internal staff circulation routines
- One way glass
- Protected vestibule emergency (fire) exits, monitored.
- Double controlled monitored entry vestibule
- Double credential revolving main entry, tailgate prevention

Internal to Building

- Elevate critical operations areas on storeys above grade
- Confine critical operations areas to core
- Room-within-a-room layouts
- Access restrictions by credential, time of day and occupancy volume

Construction

- Blast resistance at grade;
- Post disaster for operations continuity
- Pressurized core
- Zoned for smoke control

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Design to Support IT Infrastructure

Data

- Onsite data cache (storage) and operations applications processing (servers)
- Offsite operations data transactional replica storage (storage)
- Applications servers in protected area (basement) separate from operations core

Data Acquisition

- Data acquisition servers and storage
- Intelligence processing

Network

- Networking dual homed, protected double pathways
- Parallel redundant passive optical distribution

Audio /Visual

- Discrete AV network
- Discrete data storage and processing
- Video management system and video content management systems

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IT resiliency (power, communications)

Power

- Double power utility feed, below grade
- Generator backup for all essential services
- Split fuel generators
- Uninterruptible power sources, parallel redundant
- Operational capacity full redundancy
- Dual energy sources (battery, flywheel)
- Dual power distribution.

Communications

- Buried Carrier entrance services
- Double entry, diverse Carrier connections

Air Management

- Separate HVAC for human occupied areas
- Precision HVAC for equipment areas
- Operational capacity full redundancy
- 48 hours reserve for water based cooling

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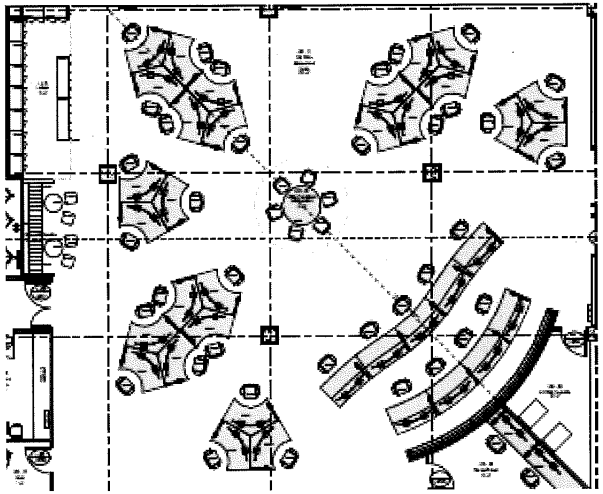
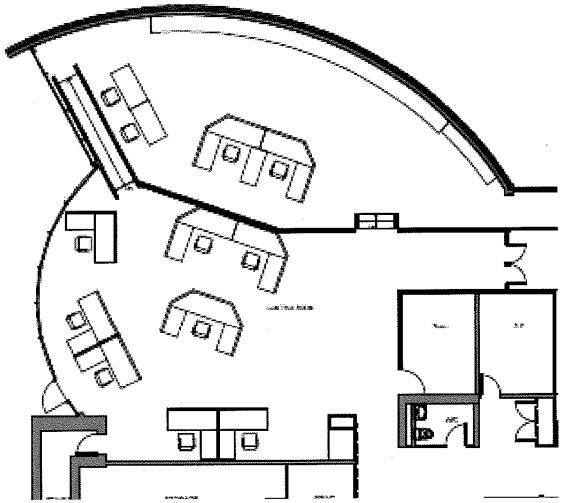
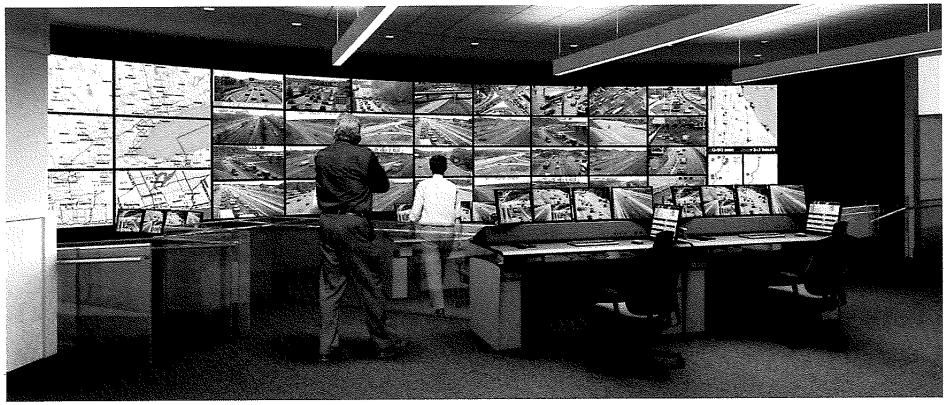
Example Layout Concepts







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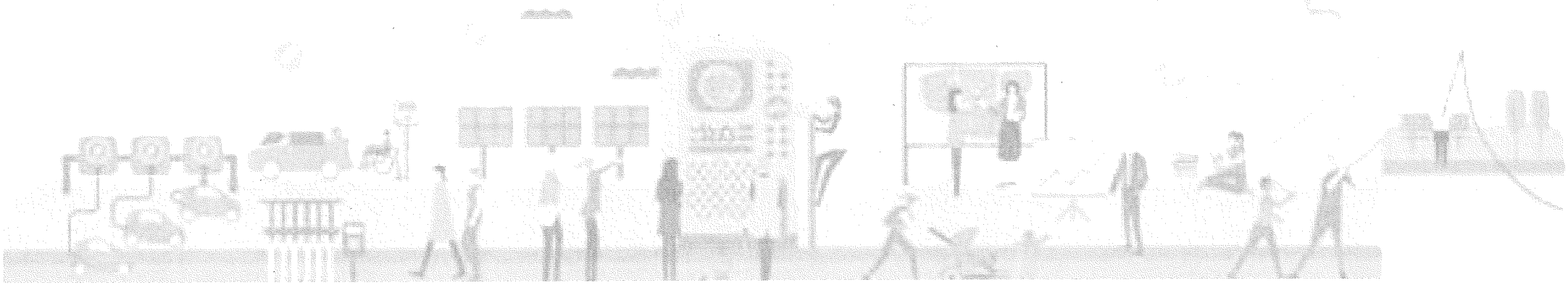
3.0 Virtual Considerations



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What is a Virtual EOC

A virtual EOC takes the physical EOC (people and processes) and moves it into "cyberspace" through a variety of technology tools.

Advatages:

- ***Time to response*** is faster; no need to assemble people; they can participate remotely
- ***Redundacy*** in case a physical EOC is damaged
- ***Cost effective*** compared to physical facility with resiliency
- ***Safer*** in times of disease outbreak or terrorist activity etc

Challenges:

- ***Utilities*** such as power, telecommunications, internet are needed for assembly and decision making
- ***Technology dependence***; requires systems and software to operate
- ***Well defined protocols*** and processes are needed to prevent silo effect (virtual participants acting independently)

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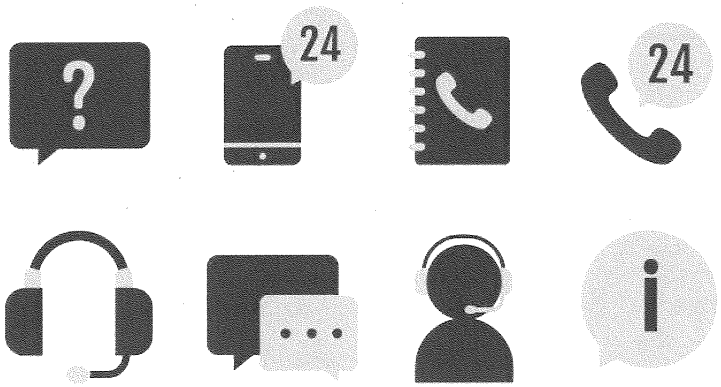
Operational Processes that can be Virtualized

IBI GROUP

- Authority and responsibility matrix management
- Contacts management & authenticication
- Comand and control
- Incident Management
- Response Management
- Dispatch Coordination
- Resource Management
- Evacuation / People tracking
- Emergency alerts and notifications
- Secure Data sharing
- Geographic Visualization
- Access to plans, photographs, maps
- Status Dashboards and Alarms
- Scenario Analysis & What-if Modeling/Simulation



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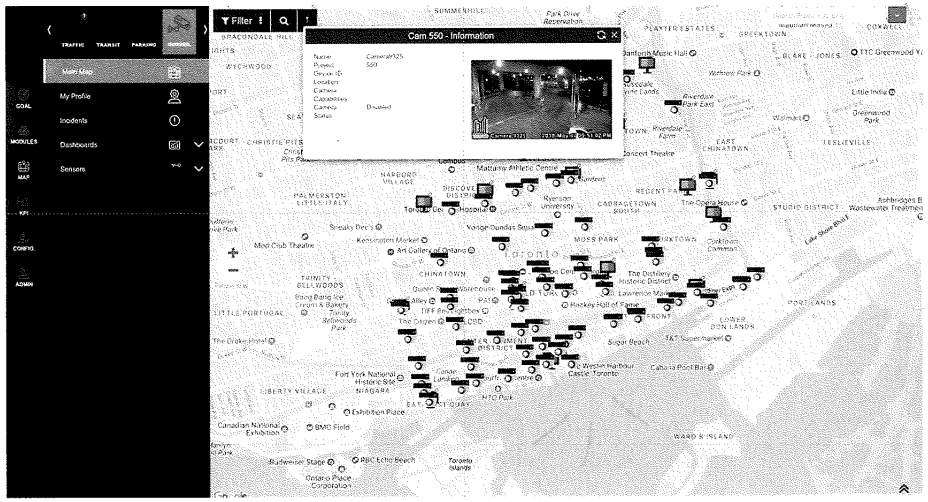
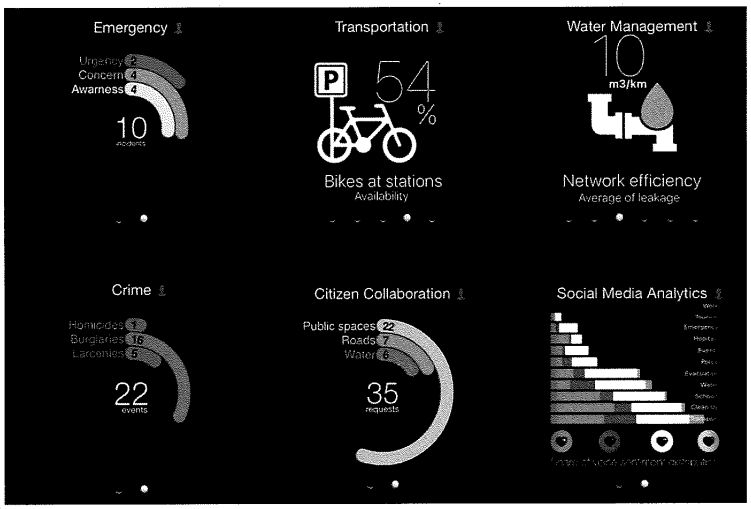
Virtual Platform Considerations

It is critical for the software platform to be intuitive and well documented, and to be backed by well developed operating procedures and MOUs. Since EOCs are not activated regularly, confusion can arise in the absence of these.

Regular and recurring use of the software, in the form of training and drills must be undertaken to ensure operational success in the event of a real emergency.





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Virtual Hub Considerations

- Are there existing virtual monitoring and control functions under use for day to day operations and/or for emergency operations?
- Is Virtual Hub system for information sharing and display only or does it control devices, generate responses and public messaging?
- What level of “intelligence” resides in the Virtual Hub and how does not work alongside decision making functionality of the child systems from which it receives data?
- Is the Virtual Hub designed to be used only in an emergency situation or is the vision to use it for day-to-day operations as well?
- Would the Virtual Hub system be designed to be used from another control centre location, from a regular office environment, or from home or other remote location?
- During an emergency, would there be operators who would input information into the Virtual Hub system and / or monitor it in real time?

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Virtual Hub Considerations

- Which systems will the Virtual Hub pull data from?
- Will the Virtual Hub include video sharing?
- Will the Virtual Hub rely exclusively on Open Data feeds and existing APIs or is the City contemplating any custom develop to facilitate this information exchange?
- Will the Virtual Hub be procured from an existing Smart City Platform vendor or is the City considering an in-house bespoke development? To what extent would it be built around a commercial dashboard product (e.g., PowerBI, Tableau, etc)?
- Would the Virtual Hub be a SaaS or On-Premises system?

Costing of a virtual hub depends on the above considerations; implementation and integration costs (one-time) can range between $2M to $5M depending on the number of systems integrated, and their readiness for integration. Ongoing product licensing costs (purchase/maintain ot SaaS) will vary based on number of fucntions and users etc. A range can be provided upon further consultation with the City.

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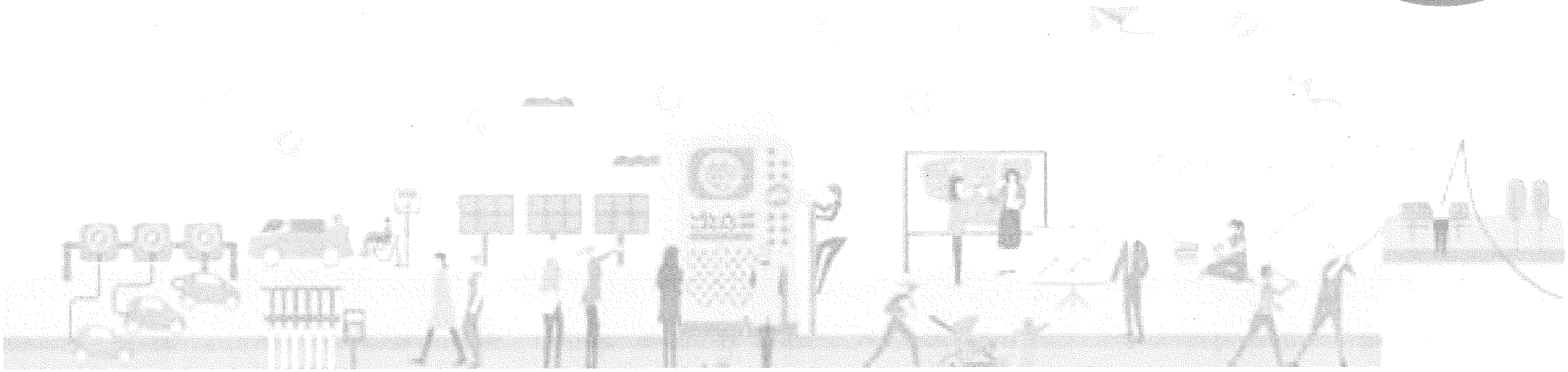
IBI GROUP

4.0 Costing Site Options



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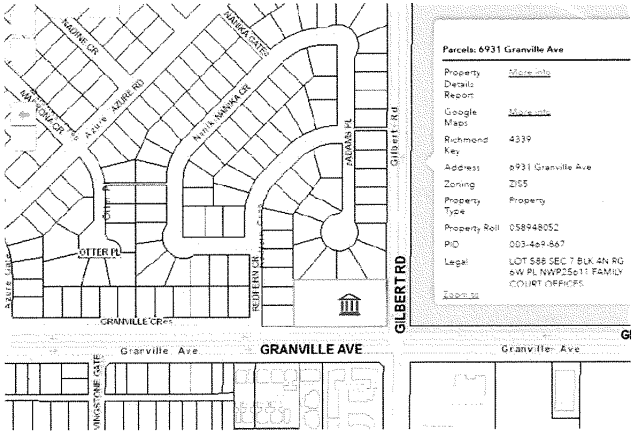
Physical Site Options

Three options under consideration:

1) Option 1 – Firehall #3

2) Option 2 – Firehall #1

3) Option 3 – New Building



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Costing Assumptions

1. This comparison is being prepared in the absence of full functional requirements. As such, the comparison is made based on limited information and should be used as such. A proper functional program requirements should be prepared and a proper analysis for each option should be considered for more accurate analysis.

2. Demolition costs for option 3 is not included in this review.

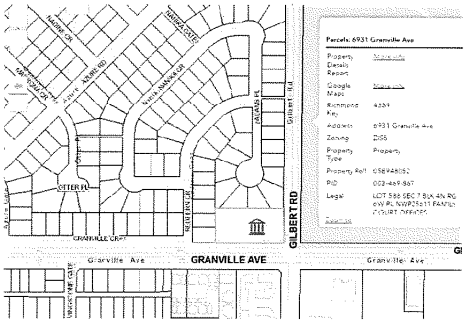
3. Primary data/servers and storage are assumed to be off site. Server cabinets for (cache) only are included in this review.

4. Floor loading is assumed to be for a typical office.

5. Cost estimates are established based on $/SF for comparable conditions.

6. Owner equipment and audio visual equipment are not included in this review.

7. Costs are based on design for natural post disaster only.



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Option 1 – Firehall #3

		Option 1 (FH-3)
Capacity		Suitable for maximum 10 small stations.
Advantages	a.	Economical to implement
	b.	Quick to Commission
	c.	Can leverage many of the existing support services in the building
Disadvantages	a.	Does not meet original functional requirements
	b.	Electrical system is tier 1 - no redundancy
	c.	M/E system upgrade will be required
	d.	Limited amenities
Cost Estimate		$1,000,000

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Option 2 – Firehall #1

	Option 2 (FH-1)	
Capacity		35 standard stations
Advantages	a.	Leverage many of the existing building services
Disadvantages	a.	Major structural and architectural upgrades
	b.	Does not meet original functional requirements
	c.	Disruptive to existing services during construction
	d.	Significant upgrade required to M/E systems
Cost Estimate		$10,000,000

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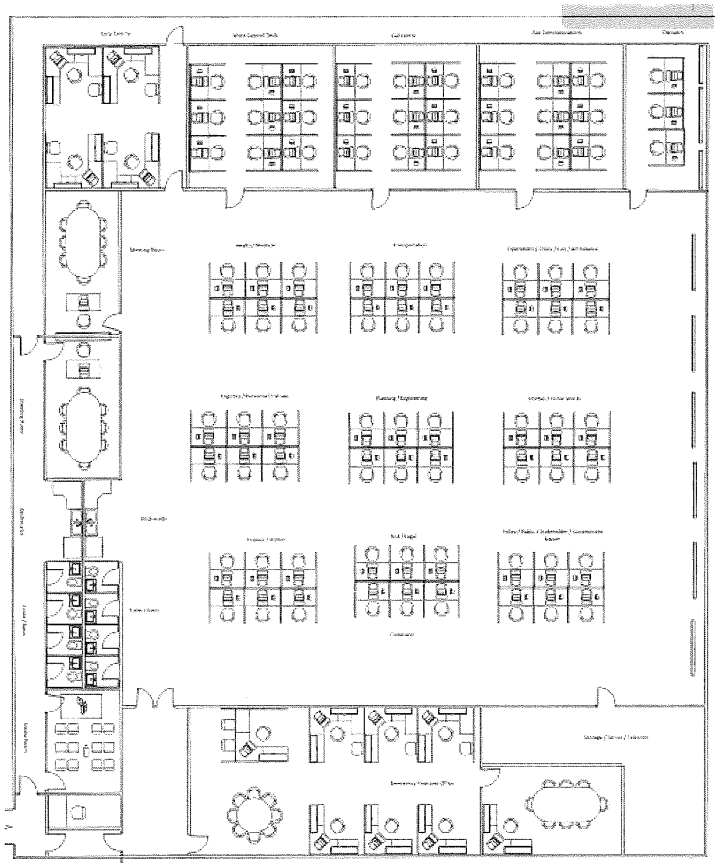
Option 3 – New Building

		Option 3 (New)
Capacity		100 Full time stations
		30,000 square feet
Advantages	a.	Meets most of the original functional program
	b	Server room is included (30 cabinets)
	c.	No disruption to existing services
	d.	Good for short and long term
	e.	Built to fit the purpose
	f.	Designed to be fully redundant
	g.	More resilient against man/natural disasters
Disadvantages	a.	More expensive than option 1 and option 2
	b.	Site may not accommodate all required parking
Cost Estimate		$35,000,000



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Notes on Physical Options / Costing

1. Option 1 can be quikckly set up as a temporary Hub that can be used as a business continuity disaster recovery centres.

2. Based on the data available, the use of FH-3 (option 1) is suitable for a business continuity disaster recovery centre for both options 2 & 3.

3. Option 2 can be further expanded to add two floors instead of one.

4. If Option 3 parameters were to be cut in half, a 50 people facility at 17,000 square feet would cost approximately $27 M. due to the main building infrastructure systems that would have to be done whether the building is small or large.

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A combined Physical & Virtual approach

- A "brick and mortar" emergency operations hub can work well in concert with a virtual hub.
- It is critical that all processes be well defined to avoid overlaps or gaps.
- A combined physical and virtual model can allow the best of both worlds: the use of subject matter experts who might be geographically dispersed, along with a concentration of support in the physical EOC
- Richmond is in a good position to leverage one of its existing Fire Halls to establish a physical hub, supported by virtual capabilities for day to day operations, and for emergency management.

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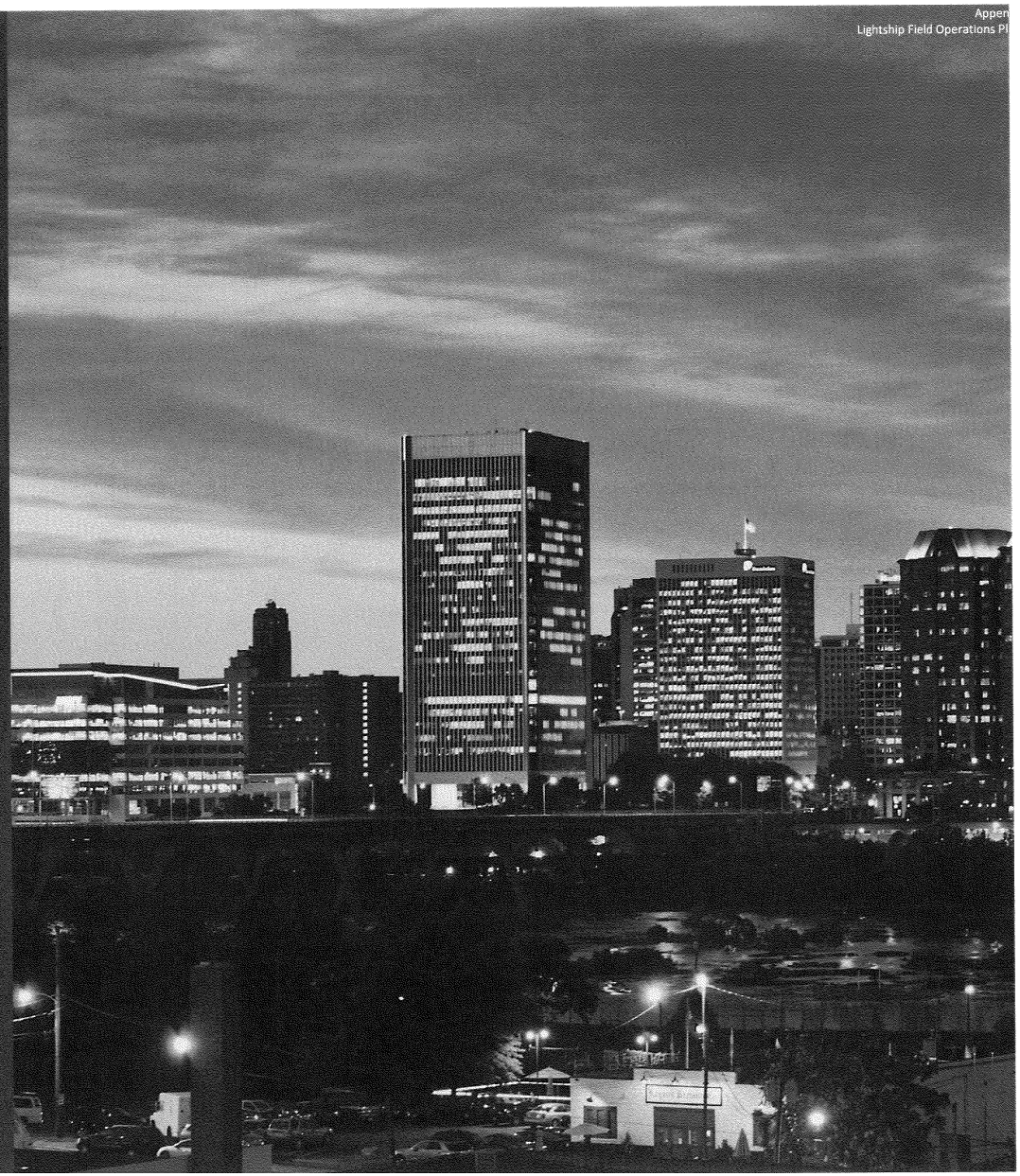
Richmond
City of Richmond, British Columbia, Canada

The City of Richmond

Lightship + IBM

Feb 1, 2019



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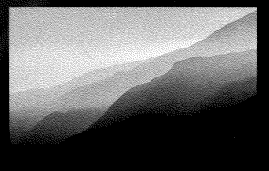
INTRODUCING LIGHTSHIP

Lightship is a field operations platform.

That helps organizations navigate their data to find the actions that will make them safer and more efficient.

Our platform is used by local, provincial, federal and First Nations governments, as well as a broad range of industrial installations across Canada and the United States.



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Lightship: A comprehensive field operations platform.

Collect

Simple powerful forms. On & Offline access.

Status

Check-ins, personal safety, incident reporting, wearable intergration.

Works

Data aggregation, communication, & project management.

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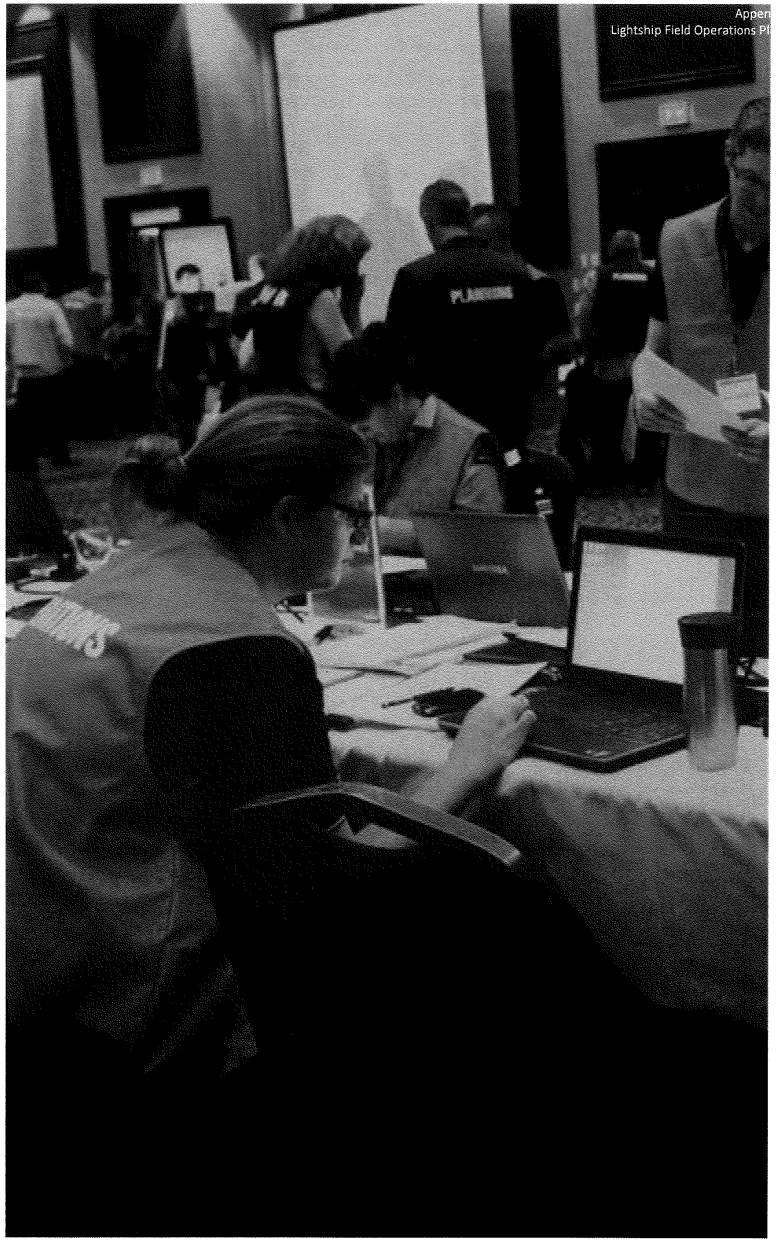
IBM & Lightship:
All Hazards Incident Management

IBM & Lightship signed a global partnership in December 2017.

Partnership Objective:

To use Lightship as the friendly user interface to apply the power of IBM Cloud, The Weather Company, and Watson (cognitive analytics) to all-hazards emergency management.



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Demo

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Use Case

2017 Freshet & Wildfires

Shared information via APIs.

→ Integrated data from local governments, First Nations, the Province of BC, and the Federal Government.

Engaged the public with crowdsourcing.

→ Okanagan residents used a simple form (HTML5) to record location, material, and number of sandbags.

→ Saved $200,000 (compared to consultant quote).

Improved communication for structure loss.

→ Simplified in-field data capture (initial damage assessments).

→ Interactive map with assessments and photos shared with the public (community Facebook page).

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Use Case

2018 Flooding - Grand Forks

Rapidly deployed into a large event.

→ Operational in 6 hours, training completed in 24 hours.

Expedited evacuee re-entry.

→ 1,700 Rapid Damage Assessments (RDA) completed in 2.5 days (50 assessors given 30 minutes of training).

→ Savings in accomodation expenses estimated to be more than $250,000 (1,100 homes).

Eliminated duplicate data entry.

→ Common information shared between RDA, Housing Gap and HEAP application forms.

→ Residents only asked for their information once.

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Use Case

Spills Response

Industry-leading Incident Management system for spills & hazardous materials.

→ Incident reporting.

→ Response dispatch.

→ In-field assessments & action log.

→ Shareable Common Operating Picture (COP).

→ Comprehensive reporting (cost recovery).

Joint development partnership with Quantum Murray Environmental.

→ National deployment of COP.

→ Establishing best practices for response deployment, records, reporting, follow-up, and audit-trail.

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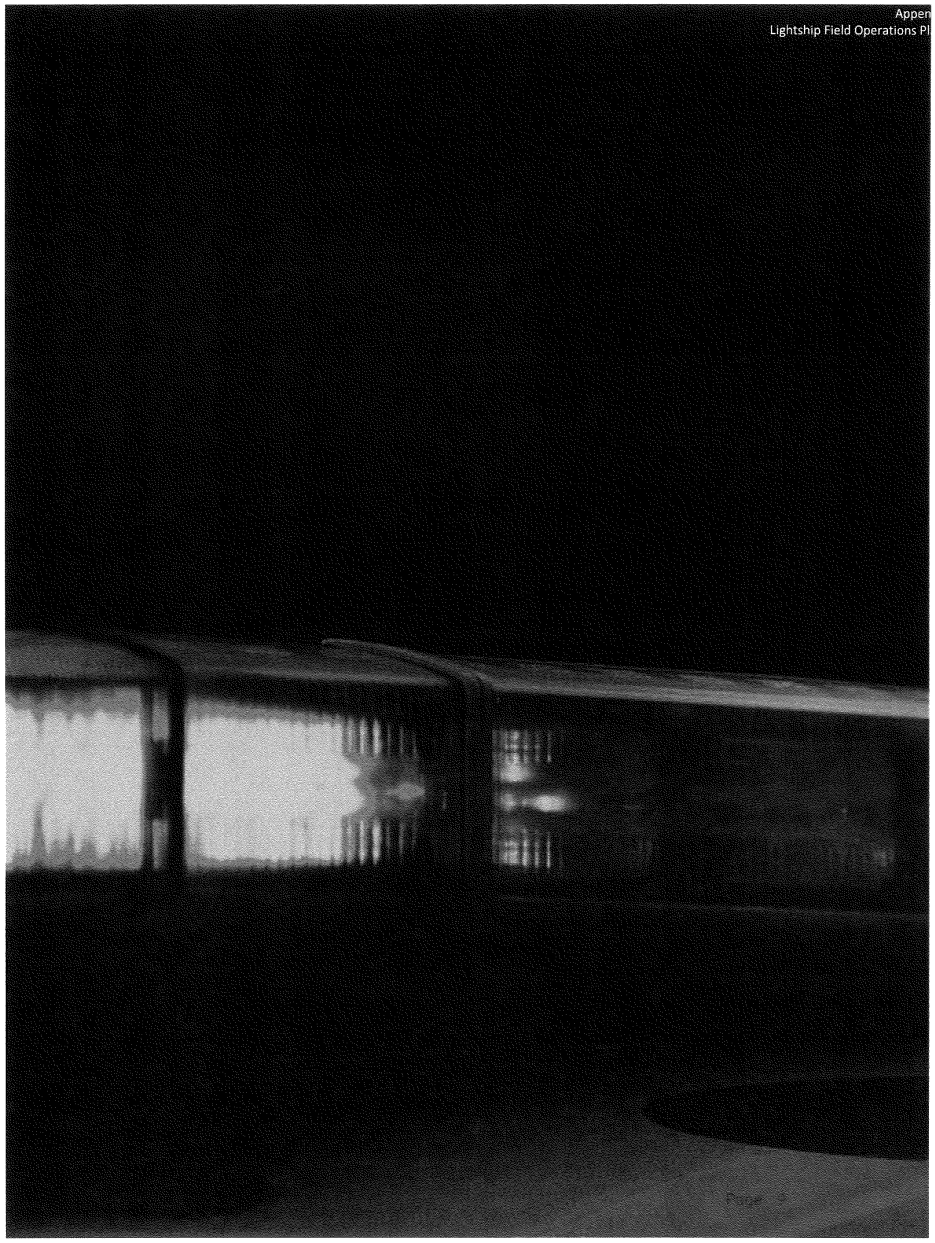
Why IBM & Lightship?

Advanced technologies applied based on operational experience.

- → Support preparedness, training, exercises, response, and recovery.
- → Manage ICS processes for incidents, resources, and expenses with full revision history (audit trail).
- → Capture, view, and share the best situational awareness including documents, photos, and other media.
- → Interact with the incident-level Common Operating Picture that includes live resource tracking of people and equipment.
- → Unify communications for all contacts including automated notifications of significant events.



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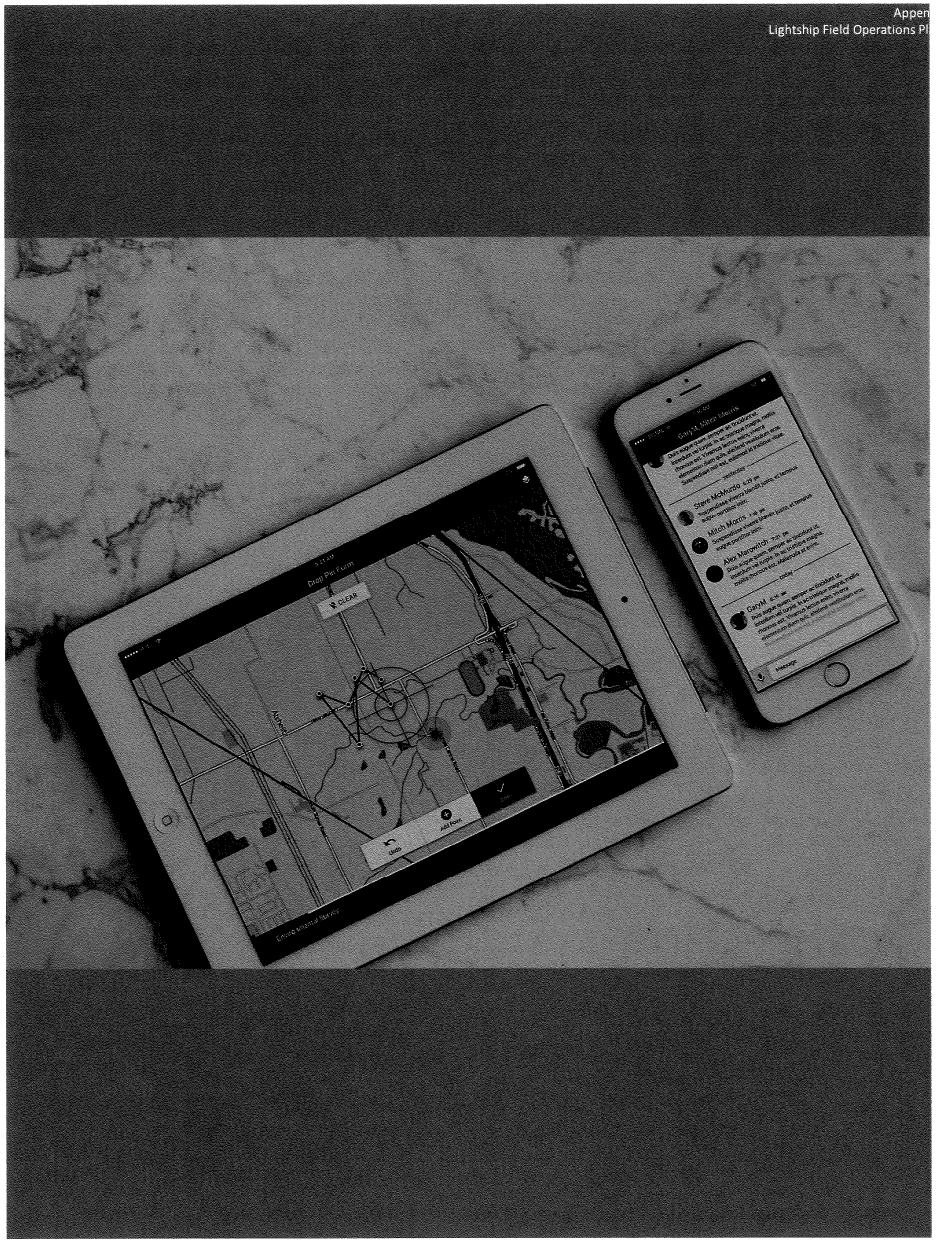
Why IBM & Lightship?

Seamless integrations for existing systems and devices.

Integrations allow the system to ingest data quickly, but also provide flexibility to evolve for future needs and improvements.

Examples of possible integrations:

- → ArcGIS
- → Maximo/Tririga
- → ETeam, DLAN
- → Wildfire 1, Wildfire Dispatch (Selkirk)
- → Corporate Accounting / other financial packages
- → Garmin inReach, SPOT, fleet tracking



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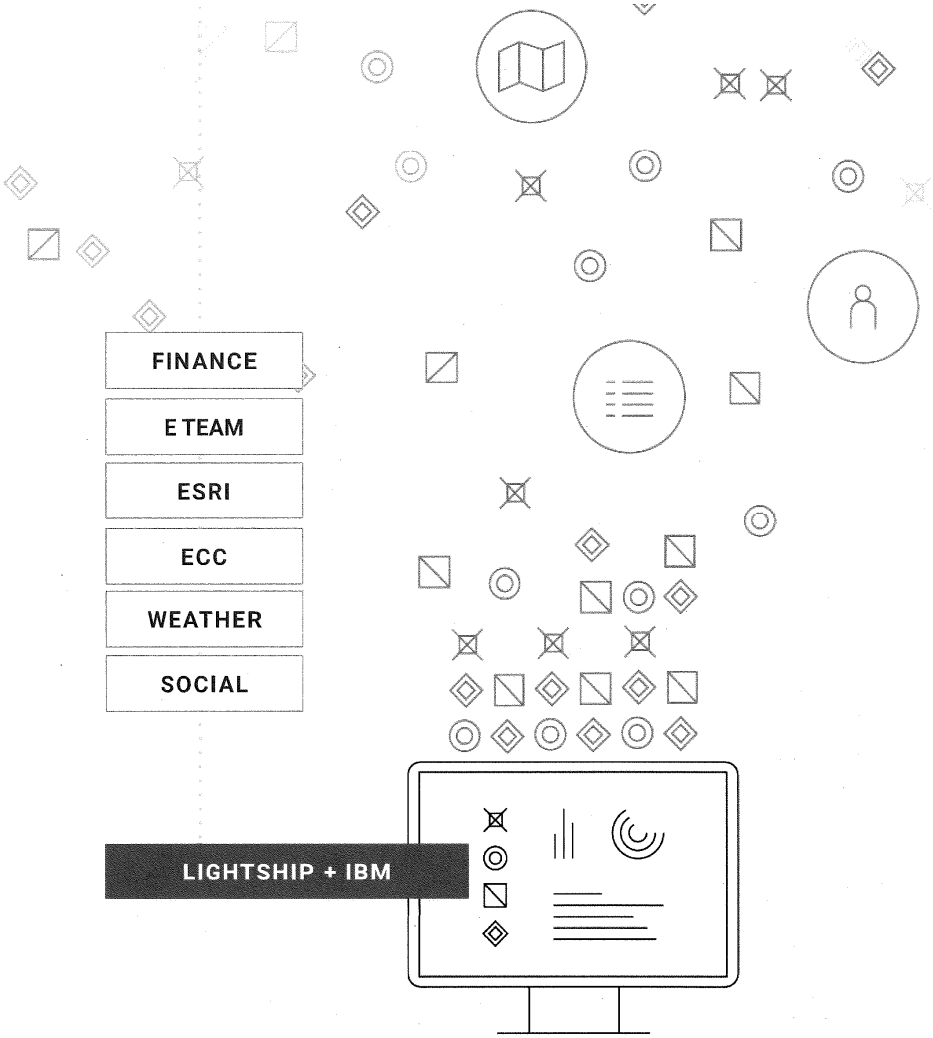
Enabling a ‘system of systems’ approach.

Lightship & IBM can unify information from multiple silos into a single Incident Management System, while minimizing operational disruption.

- → Continue using existing tools that are functional.
- → Fill gaps with new technology where appropriate.
- → Modular approach allows us to implement and scale rapidly, evolving as required.



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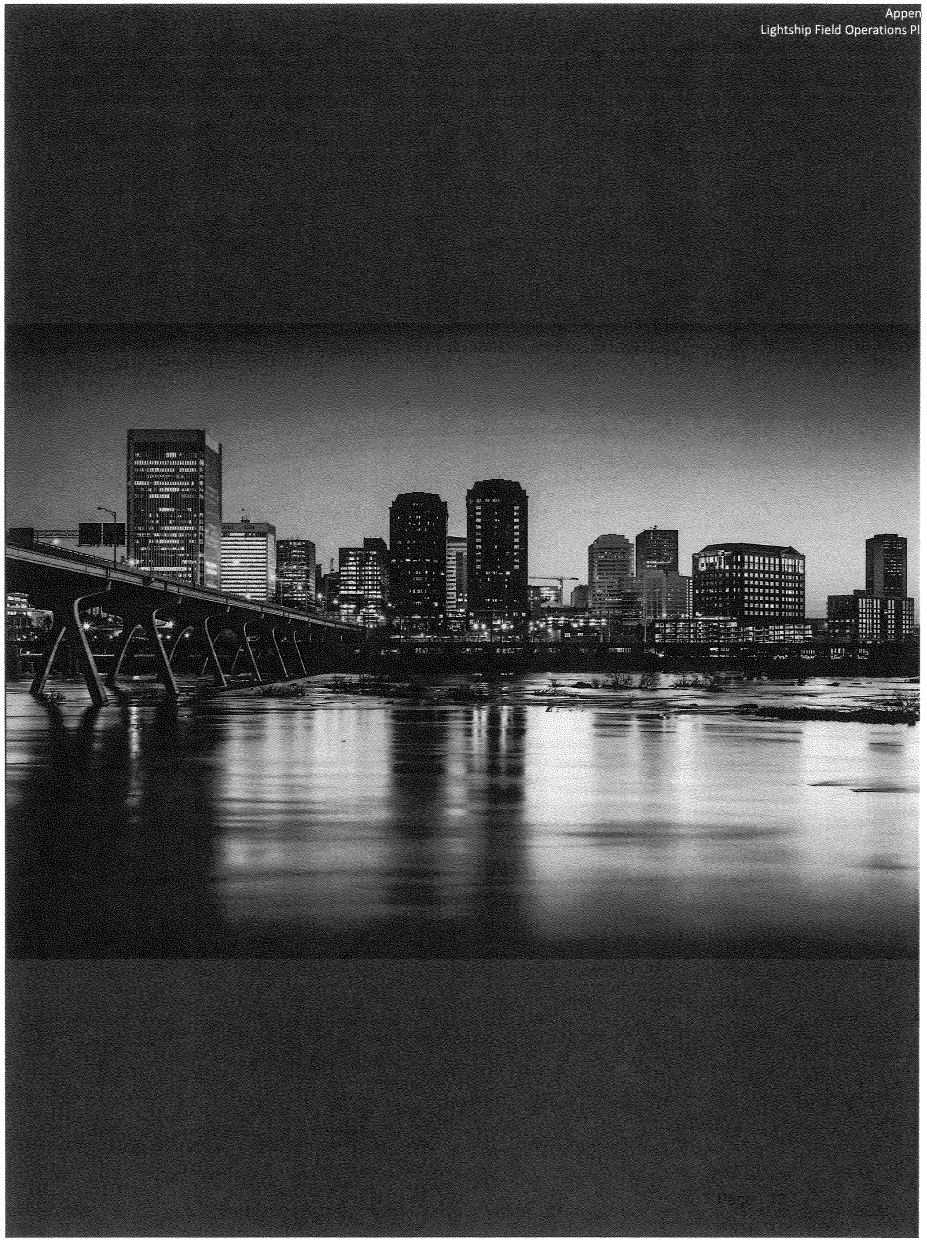
Lightship is the ideal partner for Richmond's Smart Cities Challenge.

- → We've built a comprehensive emergency response solution that can be used in disaster response, and to improve the everyday lives of citizens.
- → We can implement rapidly, and create an operational trial with a clear path to expansion that could be ready before the March 5 deadline.
- → Existing Lightship/IBM partnership could be leveraged to show how the solution can be transformative, scalable, and replicable within the community and to other communities in Canada.
- → Together with IBM, we can work with you to perform the PIA, and can build a solution that will comply with PIPEDA requirements. We bring a unique capability harnessing local, Agile, scalable resources with a 'system of systems' platform approach integrating global research, technology and investment.
- → We bring a unique capability harnessing local, agile, scalable resources with a 'system of systems' platform approach integrating global research, technology and investment.



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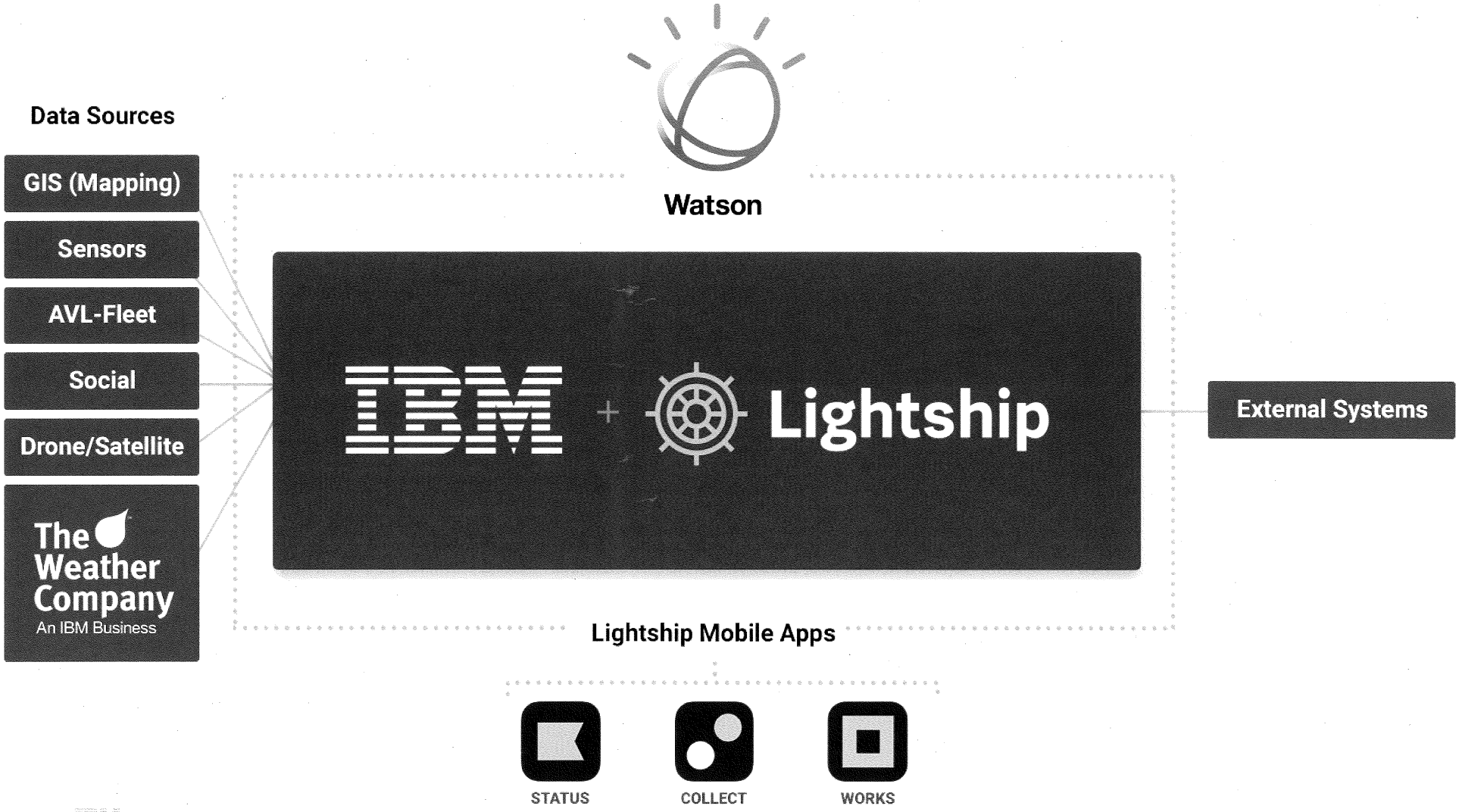

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IBM & LIGHTSHIP

Thanks

Made in BC for BC.

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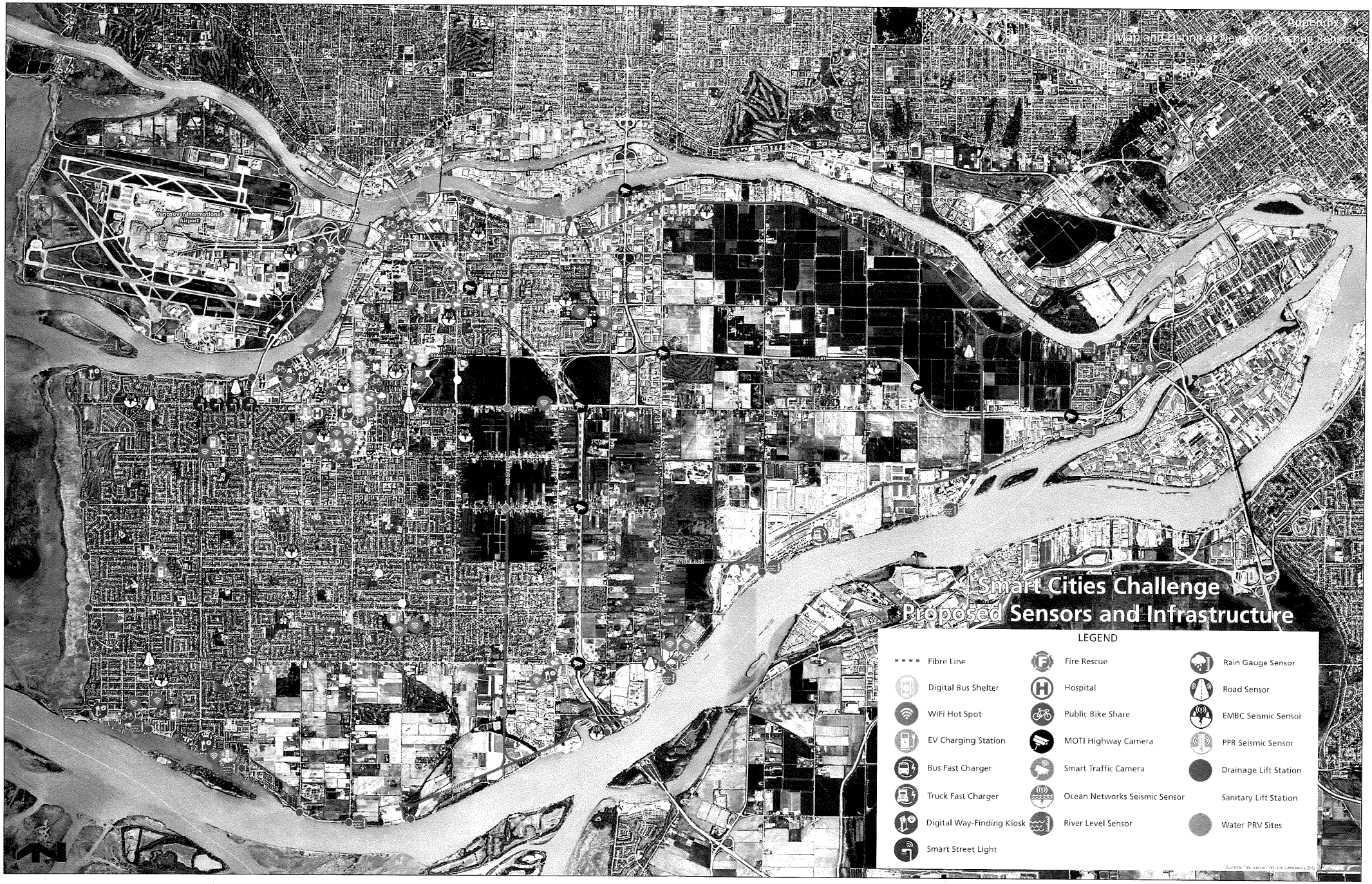

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LIST/ MAP OF CURRENT CITY SENSORS

Department	Title	Scope	Units
Eng Planning	Drainage Level Sensors	12 level sensors in our box culvert	Water levels (m)
Eng Planning/Operations	River Level Sensors	8 sensors measuring the river level in geodetic meters	River levels (m)
Eng Planning	Rain Gauge	5 rain gauges throughout the City	Rain (mm)
Eng Planning	Water Meters	100% ICI water metered and 100% SF water metered, 44% MF water meters	M3
Operations	Flow Sensors	11 magnetic flow meters	L/s
Eng Planning	AMI Gateways	11 gateways installed throughout the City collecting water meter reads from radio water meters	M3
Operations	PRVs	13 PRVs located at the water connections off of Metro Vancouver water main servicing the City	PSI
Eng Planning/Operations	Water Pressure Sensors	38 water pressure sensors located in sanitary pump stations	PSI
Operations	Forcemain Pressure Sensors	153 sanitary forcemain pressure sensors in the sanitary pump stations	PSI
Operations	Temperature Sensors	13 sensors in the sanitary pump stations	Degrees Celsius
Eng Planning	Groundwater level sensors	Installed in Burkeville for the purpose of measuring infiltration	m
Operations	Road Temperature Sensors	6 road temperature sensors across the Island	
Eng Planning / Operations	Salinity sensors	Three salinity meters installed near three pump stations that take water in for irrigation purpose	micro Siemens per centimeters (uS/cm)
LIEC	Temperature, pressure, and flow sensors	energy transfer stations (ETS): Each ETS, located within buildings, would contain various sensors and meters to track things like temperature, pressure, and flow.	Degrees Celsius, PSI
Transportation		Automatic Traffic Counts: over 1,650 induction loop detectors that provide 24-hour automated vehicle counts for each approach lane at all (175+) signalized intersections in Richmond. The counts are maintained in a database available to City staff.	
Transportation		Automatic Bicycle Counts: induction loop detectors in selected on-street bike lanes that provide 24-hour automated bicycle counts at some signalized intersections in Richmond. Work is underway to integrate the counts into the vehicle count database.	
Transportation		Intersection Traffic Cameras: network of cameras at 61 signalized intersections that use video imaging technology to detect vehicles or bicycles for traffic signal operation. Still images from the cameras that show current traffic conditions at the intersections are available on the City's website. The images are overwritten every 60 seconds and are not recorded or stored.	
Transportation		Automated Advanced Traffic Management System: an integrated platform for traffic signal control, ITS field device monitoring and control, information management, graphical data display and real-time traffic signal alert management.	

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Transportation		Automated Route Pre-emption System: a central traffic signal route pre-emption system available to Fire-Rescue vehicles. Current system allows staff to pre-empt traffic signals along a pre-determined route which provides faster response times to emergencies.	
Transportation		Uninterruptible Power Supply (UPS): battery back-up systems that power a signalized intersection and all control equipment for approximately 8-10 hours. UPS is installed at all new signalized intersections. The system has the ability to send email alerts to the City when a traffic signal has lost power and is operating under back-up battery. The system can also alert the City of other faults and alarms.	
Transportation		Traffic Radar Data Collection: 8 portable units with each unit temporarily mounted to a street light and, via radar, capable of recording two lanes of vehicle traffic 24 hours per day for up to one week. Data collected includes vehicle speed, length of vehicle, time, and date. The software allows calculation of percentage of speeding motorists at varying thresholds above the posted speed limit.	
Transportation		Traffic Induction Data Collection: 6 portable units with each unit temporarily installed in-street and, via induction, capable of recording a lane of vehicle traffic 24 hours per day for up to one week. Data collected includes vehicle speed, vehicle classification (e.g., car versus truck), temperature, time, and date.	
Transportation		Automatic Traffic Counts: over 1,650 induction loop detectors that provide 24-hour automated vehicle counts for each approach lane at all (175+) signalized intersections in Richmond. The counts are maintained in a database available to City staff.	
Transportation		Automatic Bicycle Counts: induction loop detectors in selected on-street bike lanes that provide 24-hour automated bicycle counts at some signalized intersections in Richmond. Work is underway to integrate the counts into the vehicle count database.	

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Richmond

Project Implementation Plan – Smart Cities Challenge – [Project Name]

A project of the City of Richmond

Project Implementation Plan Purpose

The Project Implementation Plan is the governing document that defines how the project will be executed, monitored, controlled, and closed. This Plan established the framework for project delivery and describes the objectives, scope, schedule, structure, approach and major deliverables. It also serves as an agreement between the Project Sponsor(s), Project Team and the Department on the established project framework and direction.

**Note: 1) Guidelines for completing this document are provided in each section in italicized text, which can be removed.*
2) Sections and sub-sections can be removed or added as deemed appropriate by the Project Team.

Project Title: Smart Cities Challenge – [Project Name]	
Project Duration:	
Project Sponsor(s):	
Project Manager:	
Project Implementation Plan Prepared by:	
1.0 Project Overview	
Brief Project Description: Provide a high level summary of the project and what is included in this Project Implementation Plan. This should include a description of the project and the project's deliverables and benefits. Excessive detail is not necessary in this section.	
Project Background	*Provide necessary background to understand why this project was initiated and what it builds off. Describe the sequence of events or conditions and why there is an interest in the completion of this project. Information in this section could include mention of, if applicable,:* • *Council referral* • *Council endorsed strategy or policy* • *Resident feedback* • *Existing work that has been undertaken for the project either in-house or by a consultant* • *Approved Capital Plan or Capital Submission* • *Existing teams in place (e.g. Building Committee, Programming Committee, Event Committee, etc)*
Project Objectives	*Provide a concise and articulate description of what this project aims to achieve and what outcome(s) is desired.* *If the end result is a product or service, include who will use it, how it will be used, and what the expected lifespan of the product/service will be.*

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Strategic Alignment	*Relate the project to the Smart Cities Vision and Challenge Statement.* *Relate the project to other existing strategic plans, policies, Council Term Goals, institutional core values/goals/practices, etc., as appropriate. This provides an indication of the project's strategic importance.*	
	City of Richmond Strategy (REDMS number where available)	**Alignment**
Related Projects	*Identify any other projects or organizational initiatives currently underway that may impact or be impacted by this project. Identify the relationship and any dependencies (e.g. prerequisite).*	
	Project	**Impact (including relationship & dependencies)**
Project Strategy and Approach	*Provide a high level description of the general strategy or direction being taken for completing this project. If the project will be completed in phases, provide a brief description of each phase.* *If this Project Implementation Plan has multiple component "projects", indicate the sub-projects and components it consists of.*	

2.0 Project Organization & Management

Project Governance	*Section to be completed by Project Office*				
Resource Requirements	*This section lays out the overall internal and external resources required to ensure successful completion of the project.*				
	Internal Resources *Identify each internal resource, their respective roles and responsibilities related to the project, and an estimate of the time commitment required.*				
	Name and Title		**Role**	**Responsibility**	**Time Estimate (FTE)**
	1.		*e.g.* • *Project Chair* • *Subject Matter Expert* • *Business Analyst,*	*e.g.* • *Has ultimate authority over project* • *Manages day-to-*	

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			Statistician, IT Technician, etc	*day aspects of the project* • *Has in-depth knowledge of and provides expertise related to a business area*	
	1.				
	2.				
	2.				
	3.				
	4.				
	5.				

External Resources / Partners

If external resources will be required for the project, identify the type of resource(s) required, their respective role related to the project and estimates on time and cost for the resource. Identify all partners and their role, capacity and readiness.

Include technology partners, vendors, government, educational, advisory, community, etc.

	Resource Type	**Role & Responsibility**	**Time and cost**	**Capacity & Readiness**
1.				
2.				
3.				
4.				

Committees	*Specify all committees that have been, or will be, established to support the undertaking of the project (e.g. Advisory, Steering, Working Committee, etc.). Identify each group, department, or organization on the committee (both internal and external). Consider how local private and/or academic sectors will be engaged to help determine solutions.*		
	Committee	**Purpose of Committee**	**Membership**

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Project Communication (internal)	*Describe the timing and nature of regular project related communication activities (e.g. meetings, meeting minutes, project status reports, etc.). Consider the core project team, internal/external resources involved, and any established special committees (or other project related factors).*		
Performance Measurement & Reporting	*Identify monitoring, reporting, and evaluation strategies and checkpoints for contingencies and course corrections, if necessary Identify qualitative and quantitative performance indicators and related data sources that are meaningful and can measure short, medium, and long-term progress towards outcomes.*		
3.0 Project Definition			
Scope	*Describe the project scope which is the work to be done to complete this project. The scope should relate back to the project objectives/outcomes and establish project limits and boundaries in terms of activities and work to be performed. The project scope needs to be measurable.* *Identify the scope boundaries and anything explicitly outside the project scope that may not be immediately obvious.*		
Major Material	*Identify major components of the project – including hardware, software, and infrastructure requirements.*		
Work Breakdown Structure	*Use this section to develop a detailed Work Breakdown Structure listing the deliverables or work components within each of the project's lifecycle stages*		
	WBS Code	**Title**	**Breakdown of deliverables**
	1		
	1.1	Identification	
	1.2	Planning	
	2	Design	
	2.1	Preliminary Design	
	2.2	Detailed Design	
	3	Implementation/Construction	
	3.1	Implementation Planning	
	3.2	Implementation	
	4	Close-Out	
	4.1	Close-Out	
Post Execution Approach	*Develop a strategy for transitioning the project to operations and sustaining continuous improvement.*		

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4.0 Schedule

Project Schedule	*Present a summary Gantt chart showing the key phases, components, critical path. Include a detailed schedule in Appendix. Specifically Identify sequence of activities.*
Schedule Dependencies	*List major schedule dependencies (other projects, permits, approvals, long-lead items), and key activities on the critical path. List any key schedule assumptions.*
Key Deliverables and Milestones	*List the project's major milestones, deliverables, and the target date for completion. This list should reflect significant milestones (e.g. start, stage, approvals (or gates), procurements, decision points, completion) and overall tangible project deliverables.*

Item	Deliverable / Milestones	Responsibility	Dates
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

5.0 Financials

Project Budget	*See attached budget table.* *Comprehensive project budget with a detailed breakdown of projected revenues, if any, and expenses by year, source, and cost type (including identification of hard and soft as well as direct and indirect costs) that is reasonable, sufficient, and in line with the performance measurement plan. Identify methods, sources, and assumptions that result in class B (substantive) estimates at a minimum.* *Identify the major components of the budget such as hardware, external goods and services.* *Identify the department responsible for funding and any contributions (financial or in-kind) from other sources, and approach to leverage revenues, if any. Identify how the Smart City prize money will amplify the impact and reach of projects.* *This will be supported by Financial Analysis activities conducted at the Project Office level.*

6.0 Procurement

	The section should include the following: Procurement scope, strategy, schedule and source.

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	Include a summary of commercial criteria considered to incentivize and enforce the procurement commitments including alignment with technology and partnership requirements.

7.0 Stakeholders and Communications Plan

Key Project Stakeholders

A project stakeholder is any person, group or organization that is involved in, may exert influence over, or is affected by the implementation or completion of the project. Identify the stakeholders (internal and external) whose interests and influence must be considered throughout the project; summarize their interests, expectations and any potential issues or concerns.

For each stakeholder group identified, consider when communication is needed, the frequency of communication, and the method/format of communication.

Stakeholder Group	Key Interest & Issues	Communication Method	Frequency	Comments

Approach

Detail approach to engaging with, gaining acceptance from, and onboarding residents and other stakeholders for projects that ensures ongoing alignment between the outcomes and their concerns and needs. Include strategies that promote community involvement and transparency and tailor to diverse stakeholders and projects

This is supported by Project Office level engagement strategy.

Anticipated Response

Experienced or expected reactions from residents and other stakeholders and approaches for managing potential issues.

Diversity and Inclusion Considerations

Identify any potential diversity and inclusion issue within the context of the project.

Does research and/or consultation suggest that the project potentially affects diverse groups of people in different ways?

Does the project create barriers for some groups of people?

What response to the issue is being suggested within the context of the project?

8.0 Technology

Technology used

Provide details about the technologies used in your projects, including relevant applications elsewhere and results of testing and/or piloting in finalist phase

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	Align the approach to the achievement of outcomes, feasibility, interoperability, replicability, and scalability of these types of projects.
Strategic Alignment	*Describe how the technology aligns to the achievement of outcomes, feasibility, interoperability, replicability and scalability of the project.*

Technology	**Alignment**

Future-Proofing	*Approach to future-proofing the technologies (i.e. safeguards against vendor-generated proprietary constraints and obsolescence, workforce that is able to implement and operate the technologies and systems going forward)*
Standards	*Adoption or development of standards, architectures, certifications, initiatives, and guidelines, including how these will enable: interoperability between the technologies, other technologies, existing community systems and services, and infrastructure replicability and scalability*
Accessibility	*Describe accessibility and usability of the technologies to diverse users, residents, and other stakeholders that support their uptake and acceptance.* *Demonstrate how other communities across Canada will benefit from your smart cities approach to the greatest extent possible.*
9.0 Data & Privacy	
Preliminary Privacy Impact Assessment	*Supported by Project Office - Preliminary Privacy Impact Assessment.* *Description of personal information to be collected, used or disclosed. Description of who you will collect personal information from and approach to assessing that person's authority to disclose the information.* *Evidence that relevant privacy authorities were consulted and their guidance was considered in its development*
Governance	*Types and methods of data collection, generation, analysis, storage, and transmission, and plans for re-use, re-distribution, derivative production, archiving, and preservation that reflects the entire data lifecycle in project design*
Legislation and Regulatory	*How the technologies comply with relevant legislative and regulatory requirements*
Open Data	*Open and big data strategies, including the ways in which they facilitate transferability and replicability of technologies and projects.*

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Ownership and Control	*Strategies for the avoidance of private-sector ownership and control of publicly-sourced data and community-owned and controlled data approaches*
Consent	*Strategies for meaningful consent in data collection, use, and disclosure.*
Data Minimization and de-identification	*Pursuit of less privacy-invasive alternatives wherever possible and de-identification of all personal information at the earliest opportunity and mitigation of potential for re-identification.*
Accessibility	*Accessible, interoperable, and open data approaches to drive community-based solutions*
Security	*Approach to the secure storage and transmission of data and assurance of effective cybersecurity*
10.0 Assumptions, Constraints and Risks	
Assumptions	*Reflect on all aspects of the project (i.e. scope, stakeholders, project team, steering committees, related projects, etc.) and list any conditions, circumstances or events assumed in the project.*
Key Issues and Constraints	*List any known constraints and/or limitations within which the project must be conducted successfully. Constraints are factors that limit and place conditions on the project. Areas of constraint could include: budget, resource availability, technology, timelines, etc.*
Risks and Risk Management	*In the table below, identify any known risks (elements and/or barriers) that may have an impact on the success of the project and appropriate mitigation strategies.* *This section is to include a succinct assessment of each risk in terms of probability/likelihood, impact and strategies for dealing with the identified risk. Where there may be implications for and/or the need to include legal, this should be flagged.* *Identify risks by type: T: Technological, E: Environmental, C: Commercial, P: Political, S: Social, L: Legal.*
Critical Success Factors	*Reflecting on the identified project goals, objectives and deliverables describe the success factors the will contribute to the completion of the project and specifics about how the goals were met. These should be measurable and quantifiable.*
11.0 Reviews and Document Control	

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Change Management	*Describe the strategy to address and approve revisions and changes to the Project Charter. This may include identifying processes for changes that are considered minor in scope (no financial, or schedule impacts) or more major in scope (financial, schedule, and/or organizational impacts).*
Revision History	*In this section, identify document changes to the Project Charter.* *If documenting the development of the Project Charter, the numbering of drafts should start at 0.1. The approved and signed off version would be 1.0 therefore any revisions undertaken after the signed version should begin at 1.1.*

Date	Author	Version	Change Description

Project Implementation Plan Approval: The undersigned acknowledge they have reviewed and approved the project charter.

Add additional approvers as required. Approvers may include internal as well as external stakeholders.

Division/Organization	Enter Name & Title Here	
	Signature	*Date*
Division/Organization	Enter Name & Title Here	
	Signature	*Date*
Division/Organization	Enter Name & Title Here	
	Signature	*Date*

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Project Budget Table

To be provided in separate excel file.

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Project Risk and Mitigation Table

Include a succinct assessment of each risk in terms of probability/likelihood, impact and strategies for dealing with the identified risk. Where there may be implications for and/or the need to include legal, this should be flagged. Identify risks by type: T: Technological, E: Environmental, C: Commercial, P: Political, S: Social, L: Legal.

Item	Risk Type	Risk	Likelihood of Occurrence (H/M/L) H: Almost Certain M: Possible L: Rare	Impact to Project if Occurs (H/M/L) H: Major M: Moderate L: Insignificant	Mitigation Strategy	Legal implications
1.						
2.						
3.						
4.						
5.						
6.						
7.						

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Risk	Category	Description	Mitigation	Owner
Data breach	Data & Privacy	Data breach from phishing attacks and software exploits.	Employee training on data privacy controls, limited user access to data, advanced software protection and backups. Strong cyber security that is aligned and maintained to leading practice.	Claudia Jesson
Partner Breach	Data & Privacy	A data breach occurs within a partner organization.	Implement comprehensive data governance sharing agreements and protocols between our partner networks – with agreed governance and security standards.	Claudia Jesson
Insufficient data breach response	Data & Privacy	Failure to inform affected data subjects about a possible breach or data leak.	Establish a process for data breach response and provide training to key staff.	Claudia Jesson
Insufficient de-identifying of data	Data & Privacy	Personal data is not de-identified and could potentially be linked back to individual.	Personal data limited in the scope and encryption of personal data.	Claudia Jesson
Resident concerns over data privacy	Data & Privacy	Residents are unclear about what data is collected and how it is being used.	Personal data limited from the scope. Clear communication on the purpose of the data collection and how data will be collected, stored and processed. Clear communication on the benefits of the data collection. Transparent communication on consent processes and withdrawing personal information.	Claudia Jesson
Non-transparent policies, terms and conditions	Data & Privacy	Outdated, inaccurate or incomplete policies and terms and conditions or conditions and policies that are too complicated. Failure to provide sufficient information on how data is collected, stored and processed.	Clear communication of data policies, dedicated data privacy resource who keeps information updated and complete. Clear communication on how data is collected, stored and processed, and why.	Claudia Jesson
Collection of non-essential data	Data & Privacy	Data is collected that does not serve a defined purpose.	Minimize data collection to required data only. Clear identification and defines purpose of data collection.	Claudia Jesson
Collection of personal data without clear consent	Data & Privacy	Personal data is collected without the knowledge of the individual or without clear consent.	Clear communication on when personal data is being collected and how it will be used. Clear consent processes and transparent communication on data ownership and how to withdraw personal data.	Claudia Jesson

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Risk	Category	Description	Mitigation	Owner
Inaccurate cost estimates	Financial	Inaccurate cost estimates can arise from insufficient planning or information (e.g. resource planning, pre-implementation studies).	Base project costs on well-established plans a comprehensive work breakdown structure. Leverage third parties with expertise to provide/affirm pricing. Base pricing off recent actuals. Include a contingency amount to account for residual risk.	Project Lead
Unforeseen costs	Financial	As we will be implementing technology that is brand new to the City's operations, there are limited in-house sources on cost details readily available.	Confirm costs through third party experts or entities with recent experience. Establish contingency reserve set aside that to be used to cover any unforeseen costs that may arise.	Project Lead
Unexpected project complexity	Financial	Unexpected project complexity can lead to further costs.	Projects are resource planned from the bottom up to minimize additional resourcing costs that are not planned for. Complexity is measures and assessed as part of project planning.	Project Lead
Lack of sustained commitment	Financial	Leadership commitment wains as the project progresses and financial support is reduced or eliminated.	High level support from City Council and Senior Management has help to drive this initiative. Financial commitments required for the duration of the initiative have been transparent. A change management approach has created strong and broad support. A sustainment strategy has been put in place.	Program Manager
Stakeholders are not aligned on Project objectives	Governance	Project context is unclear and governance of the project cannot ensure that the project is focused on the outcomes.	Internal alignment workshop with the project office, theme chairs and team leads Partner alignment workshop Regular project reviews to ensure continuous alignment.	Program Manager
Unclear accountabilities	Governance	Resources are unclear what their responsibilities and authority is and what needs to be referred to a high level of authority within the chain.	Roles and responsibilities clearly communicated Escalation process developed and clearly communicated Regular team meetings to ensure project issues are communicated and addressed in a timely manner.	Program Manager

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Risk	Category	Description	Mitigation	Owner
Poor reporting	Governance	No periodic reporting on progress.	Develop robust reporting process and communicate it clearly.	Program Manager
Lack of independent assurance	Governance	Independent check of the structures and processes to review whether the objectives will be met are not in place.	Establish independent assurance procedures	Program Manager
Lack of buy-in from project partners	Governance	Partners are not committed to the project and their roles and responsibilities.	Partner alignment workshop Regular engagement and communication with partners Collaboration with partners on projects.	Program Manager
The scope of the project changes	Project Management	Scope changes delays project and/or cause budget increases.	Ensure scope aligns with overall program objectives from the beginning; flexibility in design.	Project Lead
Identified resources are not available	Project Management	Project team loses momentum and/or effectiveness; Key staff members leave; Availability of resources with the skills and experience required for the project.	Resource planning completed prior to project commencement; clear communication of resource need; effective change management plan; transition plan in place; well defined roles and responsibilities.	Project Lead
Misalignment between Project and stakeholder expectations	Project Management	There is a risk of a mismatch between stakeholder expectations and the Project plans, which could result in a need to adjust Project plans.	Communicate project plans, progress, impacts and benefits to community members and stakeholders to ensure they are fully informed about the Project and that the Project team members understand their interests and concerns.	Project Lead
Stakeholders become disengaged	Project Management	Stakeholders ignore project communications and not participate in engagement activities.	Engage early; ensure projects remain aligned with stakeholder needs; multi-channel engagement to capture wide audience; easy to access engagement tools.	Project Lead
Lack of interest from suppliers during procurement	Project Management	Lack of responses to procurement requests.	Clear timelines; clear RFP documentation; early and regular engagement with the market.	Project Lead
Outcomes and associated targets misaligned with resident priorities	Reporting and Compliance	There is a risk of a mismatch between resident priorities and the outcomes and associated targets.	Communicate project plans, progress, impacts and benefits to community members and stakeholders to ensure they are fully informed about the Projects and that the Project team members understand their interests and concerns.	Program Engagement Lead
Availability of information and data	Reporting and Compliance	Data is not available or not current.	Investigate and determine reliable and frequently updated data sources when setting the targets.	Project Lead

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Risk	Category	Description	Mitigation	Owner
Quality of information and data	Reporting and Compliance	Data is of poor quality or misleading.	Investigate and determine reliable and good quality data sources when setting the targets. Establishing a clear purpose for the data so that only useful data is collected.	Project Lead
Poor reporting against targets	Reporting and Compliance	Reporting against targets is inconsistent and lacking in detail.	Assign a dedicated resource to be responsible for managing the collection of data and reporting against targets.	Project Lead
Requirements and commitments are not well understood	Reporting and Compliance	Projects proceed without knowledge or understanding of commitments and requirements.	Projects plans incorporate legislative requirements and other commitments that inform planning, tracking, reporting and implementation impacts.	Project Lead
Non-compliance to commitments made and requirements	Reporting and Compliance	As project activities progress commitments and legislative requirements are missed.	Strong project governance processes that include a compliance log and reporting that specifically tracks progress against commitments and requirements.	Project Lead
Lack of baseline data and data collection	Reporting and Compliance	Baseline data is incomplete or inaccurate and/or data collection against baseline is insufficient or flawed.	Baseline data is approved through the project governance structure and data collection processes are identified, checked and included in project plans and execution documents.	Project Lead
Differing capacity of stakeholders	Stakeholder	Stakeholders can sometimes have different levels of skills and experience in engaging with government. This can affect their ability to fully participate in an initiative, as well as the quality of the information they provide.	We will work with stakeholders to build their capacity to contribute, or offer modified or different models of engagement.	Program Engagement Lead
Insufficient resources	Stakeholder	The absence of the right skills can hinder collaboration across organizational boundaries and make it hard to identify issues and opportunities. This can result in damaged relationships between government and stakeholders, and poor quality advice and information.	During this planning stage, we have identifies the skills available and skills required at subsequent stages and have explored options to develop skills and/or engage external expertise.	Program Engagement Lead
Misalignment between Project and stakeholder expectations	Stakeholder	There are a significant number of stakeholders with a range of expectations and interests regarding each project. There is a risk of a mismatch between stakeholder expectations and the Project plans, which could result in a need to adjust Project plans.	Communicate project plans, progress, impacts and benefits to community members to ensure they are fully informed about the Project and that the Project team members understand their interests and concerns.	Program Engagement Lead

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Risk	Category	Description	Mitigation	Owner
Stakeholders become disengaged	Stakeholder	Stakeholders ignore project communications and do not participate in engagement activities	Engage early; ensure projects remain aligned with stakeholder needs; multi-channel engagement to capture wide audience; easy to access engagement tools.	Program Engagement Lead
Stakeholders fail to support the project	Stakeholder	Stakeholders have a negative attitude towards the project and are not invested in its success.	Engage early; Ensure projects remain aligned with stakeholder needs; establish and maintain strong relationships with stakeholders.	Program Engagement Lead
Inability to engage with certain community groups	Stakeholder	Certain community groups are not engaged and their feedback and input is not incorporated	Multi-channel engagement; multilingual communication tools; engagement tools are accessible to people with disabilities; active engagement with First Nation communities; outreach to vulnerable populations.	Program Engagement Lead
Technology architecture lacks flexibility	Technology	Ability of the architecture to support updates, changes in technology or functional requirements.	Modular architecture with non-proprietary, multi-vendor components.	Vincent Chu
Technology architecture is infeasible	Technology	The architecture is impossible to implement, excessively costly or doesn't support the requirements.	Ensure architecture and technology adheres to best practice and industry accepted standards; regular project reviews to ensure technology continues to meet project requirements and is within budget.	Vincent Chu
Technology components aren't fit for purpose	Technology	The technology doesn't not meet required functionality or is poor quality.	Regular project reviews to ensure technology continues to meet project requirements; pilot technology before implementation.	Vincent Chu
Technology components aren't interoperable	Technology	Technology components are not integrated or compatible.	Modular architecture; ensure architecture and technology adheres to best practice and industry accepted standards.	Vincent Chu
Technology components are not extensible	Technology	Technology components cannot be updated as technology evolves.	Modular architecture with non-proprietary, multi-vendor components.	Vincent Chu
Lack of resources	Technology	Ability of existing or future staff to provide technical support.	Ensure technology resources have a pro-technology mindset (existing and future employees/vendors; document all processes.	Vincent Chu

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Chart 3.8.2 Anticipated Procurement Opportunity (2020-2024)

PROJECT	PROCUREMENT REQUIRED FOR DELIVERABLES BY 2024
1.1 Smart Streets **Create Smart Streets through connected sensors and decrease the number of traffic collisions**	• Install 12,000 Smart Street Lights • Install smart traffic cameras at 15 high risk locations • Install video detection traffic cameras at key intersections across the City • Install fibre optics at key intersections across the city • Install GPS Base Emergency Pre-emption System • Install battery-based back-up system to street signals
1.2 Sustainable Transportation **Transition to Electric Modes of Transportation**	• Installation of 16 level three charging stations • Installation of 32 level 2 charging stations • 2 Mobility Hubs installed • Installation of 1 Electrified main bus-loop and one fast charging stations for trucks • Install 2 secure bike parking facilities at end of route (i.e.: SkyTrain stations, community centres – with corresponding app for the public)
2.1 Integrated Smart Alerts and Post Disaster Assessment **Detect risk to the City, integrate alerts and assess damage post-disaster**	• Network of 550 disaster mitigation sensors integrated to the Hub • 10 Shake sensors implemented and connected to the Hub • 1 Drone assessment program implemented • Online locators and damage sensors installed on electric charging stations
2.2 Resilient Energy Source for Emergency Assets **Install resilient power to function for 72 hours post disaster**	Upgrade of approximately 170 assets with smart resilient energy sources and integrated to the Hub: • Water PRV station – turbine generator (installed) 13 locations • Sanitary Pump Stations – Full 'smart upgrade' c/w battery energy system. (8 locations) • Sanitary Pump Stations w/ existing generators– full 'smart upgrade' less energy source (3 locations) • Drainage Pump Stations – full 'smart upgrade' c/w generator (7 locations) • Drainage Pump Stations w/ existing generator– full 'smart upgrade' less generator (18 locations) • Buildings (generator install) (9 locations) • Digital sign at bus shelters - battery energy system (approximately 100 locations) • Streetlight backup power (approximately 15 locations) 1 Energy dashboard to monitor assets

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PROJECT	PROCUREMENT REQUIRED FOR DELIVERABLES BY 2024
2.3 Intelligent Operations Hub **Create an Integrated Intelligent Operations Hub (physical and virtual)**	• Construction of a physical Intelligent Operations Centre • Technology implemented to detect early warning for flooding, spills in the Fraser River and earthquakes • 5 predictive models to support safety, security and mobility • Communication display of sensor data to seamlessly share data across multiple platforms • Data Lake/repository for historical data • Creation of User Federated logins and API keys
3.1 MyRichmond **Implement MyRichmond personalized engagement platform**	• Integration of mobile notification • 1 mobile application
3.2 Integrated Communication Tools **Develop Communication Tools with partners and to promote engagement with diverse populations**	• All digital information available in multilingual format and public access to multilingual call centre • Provision of additional smart devices enabled with multilingual translation tools for first responders • Intelligent Field Operations platform to seamlessly share data across multiple platforms • Data sharing platforms with partners in place
3.3 Smart Way-Finding Solutions **Develop way-finding solutions for everyday and emergency use**	**Phase 1:** • Integrate 6 digital bus shelters with direct feeds to the Hub • Build and integrate 4 additional (Class A) fully digitally enabled bus shelters and 10 fully digitally enabled way-finding kiosks • Supporting network of way-finding and interpretive signage • Develop and launch way-finding mobile app **Phase 2:** • Install 60 additional Class B and C digitally enabled bus shelters and integrate with Hub

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City of Richmond

February 26, 2019

Business and Financial Services Department
Finance Division
Telephone: 604-276-4218
Fax: 604-276-4162

Attention: To All Bidders

Re: 6443 EOI- SMART CITIES IMPLEMENTATION-ADDENDUM #2

This Addendum may include amendments and questions received, plus the City's responses to same, and forms part of the Contract Documents. This Addendum shall be read, interpreted and coordinated with all other parts. Please review and consider the following information in the preparation of your Bids.

1. Extension for Closing and Enquiries Deadline:

- Closing Time was until 3:00 p.m., local time on Wednesday, March 06th, 2019.
  Extended to 3:00 p.m., local time on Thursday, March 28th, 2019.

- Enquires was until 5:00 p.m., local time on Monday, February 25th, 2019.
  Extended to 5:00 p.m., local time on Wednesday, March 20th, 2019.

2. Question and Answer

1	Q	Please clarify if you require only an email submission **or** an electronic copy on USB and hard copy submission in a sealed envelope.
	A	Only Email submission is required.

End of Addendum # 2

Regards,

[redacted]

Sharon Bentley [redacted]
Buyer 2
Finance and Corporate Services
City of Richmond
P: [redacted]
E: [redacted]@richmond.ca

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City of Richmond

6443EOI

REQUEST FOR EXPRESSIONS OF INTEREST – 6443 EOI

SMART CITIES IMPLEMENTATION

Responses should be received at the Information Counter, Main Floor, Richmond City Hall, addressed to the Purchasing Section, 6911 No. 3 Road, Richmond, BC, V6Y 2C1, should be before **3:00 p.m., local time, on March 6th, 2019** (the "Closing Time").

All queries related to this Request for Expressions of Interest should be submitted in writing to the attention of:

Sharon Bentley, SCMP, Buyer II

email: purchasing@richmond.ca

The deadline for all enquiries is **5:00 p.m., local time, on February 25th, 2019**. The City reserves the right not to respond to inquiries received after this deadline.

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1.0 Introduction

1.1. The City of Richmond (the "City"), invites Expressions of Interest ("EOI") for Vendors, Contractors, or Services Providers to submit a response in relation to the City's Smart Cities initiative. Richmond is a finalist in the Government of Canada's Smart Cities Challenge $10 million category. For additional details refer to:

a. Infrastructure Canada's Smart Cities Challenge https://impact.canada.ca/en/challenges/smart-cities

b. The City of Richmond's Smart City http://smartcity.richmond.ca/our-smart-cities-approach/

1.2. The City is seeking responses from parties interested in supporting the City to resolve a unique problem outlined in the challenge statement below:

a. Richmond's unique Challenge Statement is: Richmond, an island city with a rapidly growing and diverse population and home of nationally significant infrastructure and government services, requires resilient physical and virtual platforms that are integrated seamlessly across all levels of government to enhance quality of life in day-to-day activities.

1.3. In the spirit of the Smart Cities Challenge the City is looking to forge new partnerships and think differently about how to engage with private sector partners. The City is asking for parties interested in participating in this Project to identify themselves and their related capabilities, as well as provide early information that will help to structure future communication and procurement processes.

1.4. The objective of this RFEOI is to identify to the City with qualified Technologies, Vendors, Contractors or Service Providers capable of supporting the work program detailed in this RFEOI, while also soliciting input on the Smart Cities initiatives, leading practice, processes, and considerations for future RFP processes.

1.5. Implementation of the City's Smart Cities work program will occur over the next 5 years. While the City is a finalist in Infrastructure Canada's Smart Cities Challenge, many of the initiatives identified in this RFEOI will proceed irrespective of the outcome on the Smart Cities Challenge.

1.6. Using the Smart Cities Approach, the aim is to achieve meaningful outcomes for our residents by leveraging the fundamental benefits that data and connected technology have to offer.

a. Openness: When communities make their data truly accessible, usable, and barrier-free, their decision-making processes become transparent, empower residents, and strengthen the relationship between residents and public organizations.

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b. Integration: Data and connected technology empower communities to break down silos that exist within local governments and public organizations

c. Transferability: When tools and technology approaches are open-source, transparent, and standardized, they can be used by communities across the country, no matter their size or capacity.

d. Collaboration: Connected technology enables communities to bring traditional and non-traditional partners to deliver common objectives.

2.0 Definitions

2.1. Throughout this RFEOI the following definitions apply:

a) "City" means the City of Richmond;

b) "City's Designated Representatives" means the City's employees or representatives who are authorized in writing to deal with the Consultant on behalf of the City in connection with the goods, materials, equipment and services or to make decisions in connection with the Contract;

c) "Closing Time" means the closing date, time, and place as set out on the title page of this RFEOI;

d) "Consultant" means the individual, partnership, corporation or combination thereof, including joint venturers, who or which is awarded a Contract who enters into a written Contract with the City to perform and to oversee the Work;

e) "Contract" or "Agreement" means the written agreement resulting from this Request for Expressions of Interest (if applicable) and executed by the City and the Selected Respondent for the Work;

f) "Expression of Interest" or "EOI" means a statement of qualifications submitted in response to and according to the terms of this Request for Expressions of Interest;

g) "Project" means the scope of Work and Requirements described in this RFEOI;

h) "Request for Expressions of Interest" or "RFEOI" means this document and related process;

i) "Requirements" means all of the specifications, requirements and services set out in the RFEOI that describes the general requirements that the goods, materials, equipment and services must meet and the selected Respondent shall provide;

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j) "Respondent" means an individual or a company (vendor) that submits, or intends to submit, a Response;

k) "Response" or "Submission" means an Expression of Interest;

l) "Selected Respondent" or "Successful Respondent" is the Respondent whose Expression of Interest, as determined through the evaluation criteria described in this RFEOI, provides the best overall value in meeting the requirements of the RFEOI, and with whom a Contract may be considered;

m) "Services" means the same as "Work", and

n) "Work" means all the labour, materials, equipment, supplies, services and other items necessary for the execution, completion and fulfilment of the Requirements.

3.0 Background

3.1. Smart Cities Challenge

a) Infrastructure Canada has initiated the Smart Cities Challenge competition open to all municipalities, local and regional government and Indigenous communities across Canada. Winning communities will be awarded with prize money to help implement their proposal to utilize data and connected technology.

b) The Smart Cities Challenge provides an opportunity for collaboration between community leaders, residents, private and public sector stakeholders to network, engage and share ideas.

c) The Smart Cities Challenge challenges communities to think, act and engage in new ways in order to:

- Realize outcomes for residents
- Empower communities to innovate
- Forge new partnerships and networks
- Spread the benefit to all Canadians

3.2. The City's initial submission including the intended work plan and community partners can be found at the following link: http://smartcity.richmond.ca/wp-content/uploads/pdf/Smart-Cities-Challenge-Submission-May%202018.pdf

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4.0 Project Objectives

4.1. The City's project will be accomplished by integrating data, technology, processes and operations, across jurisdictions, to effectively respond to incidents that could be as small as traffic congestion due to a rain event, or as big as a major earthquake. Individual components of this project can be found in Appendix A.

4.2. This initiative will improve the daily lives of citizens, while at the same time, improve community resilience to major events.

4.3. Key objectives:

a) Protect our island city;

b) Integrate citizen, infrastructure and emergency data and communication platforms;

c) Bridge language barriers;

d) Create mobility systems that enhance daily life and are scalable to improve emergency response rates and recovery times; and

e) Protects the privacy and personal information of users.

5.0 Project Scope

5.1. Smart Cities Scope– refer to Appendix A

6.0 Deliverables

6.1. The City is looking to identify potential Technologies, Vendors, Contractors or Services to support the scope identified in Appendix A. Please provide:

a) Your organization's name/ Contact person and information;

b) The relevant services or products your organization provides;

c) The scope areas (as identified in Appendix A) your organization is interested in providing services or products for.

6.2. Input on how the City should engage with vendors, contractors, and service providers to optimize delivery of the Smart Cities Challenge scope while maximizing value to residents. This includes input on structuring of a future RFP process.

6.3. Provide information on leading practices and processes to deliver on the outcomes associated with each project (as identified in Appendix A).

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6.4. Provide relevant qualifications that speak to your organizations ability to support one or more of these initiatives.

6.5. Other relevant information.

7.0 Submission Details

1.1 Delivery of Tenders

Tenders should be delivered to the City in one (1) electronic copy delivered, by email, to the Contact Person. Tenderers should ensure that:

1. Such email is title "6443- Smart City Implementation"
2. All file attachments which, collectively, comprise such electronic copy do not exceed 10 MB in total.
3. All file attachments which, collectively, comprise such electronic copy are delivered in one (1) email.
4. Such electronic copy is consolidated into as few file attachments as practicable.

The City will not accept electronic copies via File Transfer Protocol (FTP) sites.

7.1. Submissions will be evaluated at the discretion of the City based upon the information contained in the submissions.

7.2. Submissions received after this time may, at the City's discretion, be returned to the sender unopened.

7.3. Hard copy and electronic copy Submissions should be identical to each other and in the same file format (i.e. Excel, Word, PDF).

7.4. Submissions should be submitted in a sealed envelope or package, marked with the Respondent's name and the RFEOI title and number.

7.5. Any and all costs associated with the preparation and submission of the Response, including any costs incurred by the Respondent after the Closing Time, will be borne solely by the Respondent.

7.6. By submitting a Response, the Respondent acknowledges and agrees that the City will not be responsible for any costs, expenses, losses, damages (including damages for loss of anticipated profit) or liabilities incurred by the Respondent as a result of or arising out of submitting a Response for the proposed Contract, or due to City's acceptance or non-acceptance of their Response or any breach by City of the bid contract between City and each of the Respondents or arising out of any contract award not made in accordance with the express or implied terms of the Response documents.

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8.0 Inquiries

8.1. Questions relating to this RFEOI may be directed to Sharon Bentley, SCMP, Buyer II, by email to purchasing@richmond.ca by the deadline listed on the title page of this RFEOI.

8.2. Inquiries and responses relating to the RFEOI will be posted on BC Bid (http://www.bcbid.gov.bc.ca/open.dll/welcome?language=En). It is the sole responsibility of each Respondent to check these sites on a regular basis for amendments, addendums, or questions related to this RFEOI.

8.3. The decision to issue or not issue an addendum is entirely at the sole discretion of the City.

8.4. Each addendum will be incorporated into and become part of the RFEOI document. No addendum or amendment of any kind to the RFEOI is effective unless it is contained in a written addendum issued by the City's Purchasing Section.

9.0 RFEOI Process

9.1. This RFEOI is not an agreement to purchase goods or services. The City is not obligated to select a Respondent or to proceed to negotiations for a Contract, or to award any Contract. As such, the City reserves the right to unilaterally take the following actions, and shall not be liable for any such actions:

a) accept a Response that deviates from the Requirements or the conditions specified in this RFEOI;

b) accept a Response which is not the lowest cost Response;

c) accept all or any part of a Response;

d) amend the scope and description of the Services as described in this RFEOI, and the qualifications that may be required to meet those requirements;

e) assess the ability of the Respondent to perform the Contract and reject any Response where, in the City's sole estimation, the personnel and/or resources of the Respondent are deemed insufficient;

f) cancel the RFEOI process and recommence in respect of the same RFEOI with the same or an amended set of documents, information and requirements;

g) cancel the RFEOI process at any time and reject all Responses;

h) not accept any Response in response to this RFEOI;

i) reject a Response even if it is the only Response received by the City;

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j) reject any and all Responses, including without limitation the lowest priced Response, even if the lowest priced Response conforms in all aspects with the RFEOI;

k) reject or accept any or all Responses at any time prior to execution of a Contract;

l) reject Responses which are incomplete, conditional or obscure or erasures or alterations of any kind, or

m) split the Requirements between one or more Respondents.

9.2. The Respondent acknowledges and agrees that any RFEOI is in no way whatsoever an offer to enter into an agreement and submission of a Response by any Respondent does not in any way whatsoever create a binding agreement. The Respondent acknowledges that the City has no contractual obligations whatsoever arising out of the RFEOI process and may elect to terminate this RFEOI at anytime.

10.0 Modification of Terms

10.1. The City reserves the right to modify the terms of this RFEOI at any time at its sole discretion. This includes the right to cancel this RFEOI at any time without liability to any Respondent.

11.0 Ownership of Submissions

11.1. All documents submitted to the City, including Expressions of Interest, and any drawings, plans and models (as applicable), become the property of the City and will not be returned to Respondents. They will be received and held in confidence by the City, subject to the provisions of Section 20.

12.0 Right to Not Accept Any Expression of Interest

12.1. The City reserves the right to not accept any Expression of Interest and is not bound to enter into an agreement with any Respondent or issue a Request for Proposal. In the event that no Expression of Interest is selected, the City will declare the RFEOI terminated, in which case the City reserves the right to enter into negotiations with any party, regardless of whether or not such party previously participated in the RFEOI.

13.0 No Commissions

13.1. The City will not pay any commission to any Respondent or any agent acting on behalf the Respondent in connection with any transaction arising from the RFEOI. Any agent working with or for an interested party is assumed to be compensated by the Respondent.

14.0 Use of this Request for Expressions of Interest

14.1. This document, or any portion thereof, may not be used by others for any purpose other than for the submission of Expressions of Interest.

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15.0 Conflict of Interest

15.1. Respondents are responsible for ensuring that any and all conflicts of interest or potential conflicts of interest are disclosed in their Response. Failure to disclose a conflict of interest may result in the rejection of the Response.

16.0 No Solicitation

16.1. If any directors, employees, officers, agents, consultants, or representatives, or other representative of a Respondent makes any representation or solicitation offering a personal benefit to any officer, employee, agent, consultant, or elected official the City, concerning the Respondent's Response, the City reserves the right to reject the Respondent's Response to this RFEOI.

17.0 No Lobbying

17.1. From the date on which this RFEOI is issued until the RFEOI process is terminated, Respondents (including any directors, employees, officers, agents, consultants, or representatives) should not communicate with the City, directly or indirectly, about the RFEOI except via the designated Contact Person listed on the title page and in Section 8.1 of this RFEOI.

18.0 Publicity

18.1. Respondents must not issue any news release or other public announcement that discloses details of this Request for Expression of Interest, or the Respondent's Response to this RFEOI, without the prior written consent of the City.

19.0 Information Disclaimer

19.1. The City and its directors, officers, elected officials, employees, designated representatives, agents consultants, partners and advisors are not liable or responsible for any oral, verbal or written information, or any advice, or any errors or omissions, which may be contained in this RFEOI or otherwise provided to the Respondent pursuant to this RFEOI.

19.2. The City makes no representation, warranty, or undertaking of with respect to this RFEOI and their respective its directors, officers, elected officials, employees, designated representatives, agents, consultants and advisors, shall not be liable or responsible for the accuracy or completeness of the information in this RFEOI or any other written or oral information made available to any interested person or its advisors, and any liability however arising, is expressly disclaimed by the City.

19.3. The Respondent shall conduct its own independent investigations and interpretations and shall not rely on the City with respect to information, advice, or documentation provided by the City. The information contained in this RFEOI is provisional and may be superseded by a contract, if formed, between the City and the Selected Respondent.

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20.0 Confidentiality, Freedom of Information and Protection of Privacy

20.1. All submitted Expression of Interests shall become the property of the City who reserves the right to release information to the public about the Expressions of Interests received and any potential agreement(s) entered into. As the property of the City, Expression of Interests will be considered government records, which are public documents and subject to the *Freedom of Information and Protection of Privacy Act* of British Columbia. However, any commercial information that could cause potential economic harm to a Respondent's business interests should be identified by the Respondent as such.

20.2. Information pertaining to the Project or Services obtained by the Respondent as a result of participation in this RFEOI is confidential and must not be disclosed without written authorization from the City.

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Appendix A - City of Richmond – Smart Cities Projects Scope Summary

No.	Project	Scope
Theme 1: Smart Street Technology		
1.1	Smart Streets	• Install smart street lights on roadways with LED motion sensors, sound sensors, environmental sensors and Wi-Fi. • Install fibre optics cable and deploy smart cameras at signalized intersections. • Enable data flow from sensor location to central HUB. • Installation of a GPS Based Emergency Pre-emption System at signalized intersections. • Installation of additional features to support Richmond's Advanced Traffic Management System (ATMS). • Installation of Uninterruptible Battery Backup System at all signalized intersections.
1.2	Sustainable Transportation	• Increase infrastructure required to charge electric vehicles including buses and quick charge for buses. • Create connected multi-modal mobility hubs designed to seamlessly integrate multiple travel modes in one location.
Theme 2: Smart Disaster Mitigation Technology		
2.1	Integrated Smart Alerts and Post Disaster Assessment	• Install drainage water reuse system, pipes and drainage grates sensors to assess blockages, breakage or decreases of water flow during a seismic event. • Install drone technology to use for initial building assessments and monitor dike breach post disaster. • Install city-wide sensors to monitor the ground water levels (predictors of soil liquefaction) water quality, seismic activity and air quality on a street by street basis for the ongoing health and safety of the community and in case of an emergency. • Install early detection earthquake sensors and supplemental cameras on local and senior government assets. • Install online locators and damage sensors to increase accessibility to electric charging stations. • Coordinate all early warning systems.
2.2	Resilient Energy Source for Emergency Assets	• Equip vital post disaster infrastructure with sustainable power sources to provide at least 72 hours when the central electrical grid is compromised. • Ensure way-finding infrastructure such as highway signage and digital bus shelter advertising boards can operate without electricity for 72 hours. • Enable data flow for integrated energy dashboards for virtual use and connect to the central HUB. • Utilize renewable and clean energy sources for back-up power generation.
2.3	Integrated Municipal Operations HUB	• Create a Digital Intelligence platform to allow partners to share data, information and insights in real or near real time. • Implement an integrated traffic management and emergency response machine learning-enabled decision support system to forecast and mitigate impacts. • Create an everyday operation centre to manage City operations and integrate cross functional data collected to seamlessly transition to an emergency operation centre. • Integrate all data collection points to a virtual operations HUB. • Create a mobile application/dashboard to ensure decisions can be made offsite when needed.

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Appendix A - City of Richmond – Smart Cities Projects Scope Summary

No.	Project	Scope
Theme 3: Integrated and Connected Communities		
3.1	MyRichmond	• Enable residents and other stakeholders to access a variety of City services and planning and information resources via the MyRichmond online platform using a single identity and password • Create a public dashboard for residents and businesses to create individual emergency plans and identify availability of emergency supplies within the community such as power access across the City, operational gas stations, grocery stores, bus stations. • Provide up to date information on community assets including childcare centres and other community care facilities on Richmond Interactive Map (RIM). • Connect businesses to MyRichmond for access to enhanced online civic services and emergency planning resources. • Increase functionality of MyRichmond for users of mobile devices.
3.2	Integrated Communication Tools	• Develop a communications network and processes that allows emergency notifications and other public information (from multiple organizations) to be seamlessly and simultaneously delivered to the public through multiple channels. • Integrate multilingual communications tools on City information platforms. • Develop emergency preparedness social equity strategies to ensure accessible communication for people with disabilities or others who may be isolated from general community due to economic, health or other conditions. • Develop enhanced emergency preparedness training for residents and businesses.
3.3	Smart Way-Finding Solutions	• Create and implement an integrated way finding strategy for every day and emergency use. • Collaborate with partner agencies and businesses to provide access to digital screens and message boards within the public domain to deliver real time emergency notifications. • Integrate use of public domain digital assets with online communications to deliver enhanced public service and real time emergency notifications.

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City of Richmond

Emergency Management Plan

5278939 – Emergency Management Plan - July 13, 2010 – V 1.0
December 31, 2016 – V 1.1

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Richmond

Emergency Management Plan

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Acknowledgements

The Emergency Management Plan demonstrates Richmond City Council's commitment to ensure the health, safety and economic well-being of the community by providing guidance and direction in a major emergency or disaster.

City Council's leadership in this area has included spearheading a number of Emergency Management Planning initiatives to ensure a well-planned and managed approach to emergencies. Council has assigned responsibility for emergency management plans and procedures to the Emergency Management Planning Committee.

Revision History

Date	Pages	Description
July 13, 2010	All	Updated to current information
December 2016	All	Confirmed Acts & Bylaws are current & still applicable; removed certain Appendices that can be accessed online to condense document. Updated "Emergency Notification System" to account for RichmondBC Alert.

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Richmond

Emergency Management Plan

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1.0 Plan Authority

Provincial Legislation

BC Emergency Program Act

Pursuant to the B.C. Emergency Program Act, 1996, Section 6 (1), (2) and (3)"a local authority is at all times responsible for the direction and control of the local authority's emergency response." Furthermore, "a local authority must:

- "Prepare or cause to be prepared local Emergency Management Plans respecting preparation for, response to and recovery from emergencies and disasters.
- ...establish and maintain an emergency management organization..."

Local Authority Emergency Management Regulation

The Local Authority Emergency Management Regulation, 1995, section 2 (1), (2), (3), specifies the local authority's Emergency Management Plan must reflect the potential emergencies and disasters that could affect the jurisdiction. According to the regulation, a local authority must:

- Provide policy guidance and direction to the emergency management organization and procedures by which that guidance and direction is to be provided.
- Require a periodic review and updating of the Emergency Management Plans.

Additional provincial legislation relevant to emergency management include:

- Emergency Program Management Regulation, 1994
- Compensation and Disaster Financial Assistance Regulation, 1995

The Emergency Management Plan was prepared in accordance with the legislative requirements outlined in the British Columbia Emergency Program Act and Local Authority Emergency Management Regulation. Further, this plan is based on the B.C. Emergency Response Management System (BCEMS) standards and has adopted the response objectives, structure and functions prescribed in Section 4: Concept of Operations.

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State of Local Emergency

The Emergency Program Act provides municipalities with the authority to declare a state of local emergency when extraordinary powers are required to effectively respond to an emergency. Following the declaration, the local authority may authorize selected persons or agencies to use the extraordinary powers. The most common powers used include ordering a mandatory evacuation and obtaining access to private property where public safety is the issue. A complete list of powers and procedures for Declaring a State of Local Emergency can be found under the Emergency Program Act.

A declaration is not needed to implement the Emergency Management Plan, activate the Emergency Operations Centre, gain liability protection or qualify for disaster financial assistance under the Emergency Program Act.

Disaster Financial Assistance

Under the Emergency Program Act and the Compensation and Disaster Financial Assistance Regulation, local authorities can receive financial assistance for eligible emergency response costs incurred during a disaster, and assistance for some post-disaster recovery costs expended to repair or restore public works and facilities that are essential to their operation.

The Provincial Emergency Program is permitted under the Act and Regulation to assist a local authority with 100 percent of eligible response costs. Local authorities may qualify for up to 80 percent of recovery costs incurred repairing public works infrastructure, city facilities, and materials essential to the functions and operations of the local authority.

In addition to repairing the local authority's facilities, recovery also includes helping key elements of the community's return to normal operations. Eligible costs can include the hiring of engineers or other experts to conduct damage assessments, costs incurred by establishing a recovery centre or related activities, and compensation for private land or property acquired in the course of response.

Eligible Response and Recovery Costs

Expense Type	% of Eligible Costs
Local Authority Response	100%
Local Authority Recovery (accepted claim that exceeds $1,000)	80%
Community Recovery (accepted claim that exceeds $1,000)	80%
Recovery Administration	10%
Business Interruption	No eligible Costs

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Financial Assistance for Emergency Response and Recovery Costs: A Guide for BC Local Authorities and First Nations, PEP, September 2005.

Local Legislation

Local Legislation and Agreements

Richmond City Council has approved the bylaws and agreements relevant to corporate and departmental emergency management as outlined in the following table:

Document Number	Name	Date approved by council
Bylaw 7898	Emergency Management Organization Establishment	March 14, 2005
REDMS 135090	Public Works Mutual Aid Agreement	February 14, 2000
Bylaw 6553	Agreements - Mutual Aid Fire Fighting Services	November 14, 1995
	Municipal Police Unit Agreement	April 28, 1992
Bylaw 8475	Pollution Prevention & Clean-up Regulation Bylaw	October 13, 2009

City of Richmond, Emergency Management Organization Establishment Bylaw

The Emergency Management Organization Establishment Bylaw, No. 7898 establishes the structure under which the City will operate in an emergency as well as designates the emergency planning responsibilities. The bylaw identifies staff that comprises the Emergency Operations Centre Management Group. This group is responsible for the direction and coordination of the City's response and recovery efforts during a disaster, and advising Council of the declaration of a state of local emergency and the delegation of the powers required.

The bylaw provides the Emergency Operations Centre Management Group with the authority to expend City funds which are not included in the City's financial plan in order to effectively respond, preserve life, health and the protection of property during an emergency or disaster.

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2.0 Introduction

2.1 Purpose & Scope

The Emergency Management Plan provides the authority and guidance to the City of Richmond's staff to ensure a well-managed response to major emergencies within the jurisdiction. It is based on the standards established for the "British Columbia Emergency Response Management System".

The plan:

- Provides an overview of the City's emergency management and reporting structure.
- Outlines the roles and responsibilities of City staff and departments and other agencies involved in the response effort.
- Provides overall strategy for the City's emergency mitigation preparedness, response and recovery measures.
- Identifies key priorities and actions to be undertaken in preparing for and responding to a major emergency or disaster.
- Outlines the procedures for Declaring a State of Local Emergency and delegating the required powers.
- Encompasses Richmond's jurisdictional boundaries for response operations and the type of emergencies that are beyond routine events.

The Emergency Management Plan is supported by threat specific and departmental plans which outline detailed strategies and procedures for carrying out emergency response efforts. These plans are described in Section 3.3.3: Emergency Management Organization – Emergency Plans.

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2.2 Assumptions

This plan is based on the following assumptions:

- City staff are familiar with the Emergency Management Plan, will attend the required training, and will carry out their assigned responsibilities.
- That staff have taken efforts to become personally prepared. In the event of a major emergency, staff will ensure the safety and security of their loved ones before reporting to work.
- That during a major disaster, municipal resources may be overwhelmed, and that the general public should be prepared to survive on their own for a minimum of 72 hours to seven days following an event.
- That assisting and cooperating agencies and departments will develop necessary plans or procedures for the delivery of their assigned emergency response and recovery responsibilities.
- That this plan is a living document. It will be reviewed and updated regularly to reflect changes in threats and our level of risk based on lessons learned from past incidents and exercises.

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3.0 Emergency Management Organization

3.1 Emergency Management Structure

As required under the Emergency Program Act, Richmond City Council, through the Emergency Management Organization Establishment Bylaw No. 7898, has established an Emergency Management Organization. As illustrated in Figure 1, this organization addresses Emergency Management Planning obligations and the City's response structure in the event of a major emergency or disaster. Responsibilities of the Emergency Management Organization are as follows:

Council

Under the Emergency Program Act, Council is at all times responsible for the direction and control of the local authority's emergency response and must prepare local emergency plans respecting preparation for, response to and recovery from emergencies and disasters. Prior to an emergency, a Council standing committee of the whole, will direct the development of key aspects of the City's Emergency Management Program.

During a response, Council will act as the Policy Group to set emergency policy, legislation and provide overall direction to the Emergency Operations Centre. As the Policy Group, Council responsibilities also includes authorizing a Declaration of a State of Local Emergency to delegate the powers available under the Emergency Program Act. Council must monitor the use of those powers by appointed individuals.

Emergency Operations Centre Management Group

The Emergency Operations Centre Management Group is chaired by the Chief Administrative Officer or alternate, and includes senior City staff and key emergency services personnel responsible for directing and coordinating emergency response efforts. This group forms the management team at the City's Emergency Operations Centre during an activation and is responsible for the direction and control of the City's response and recovery operations during a disaster.

Emergency Planning Committee

The Emergency Planning Committee is responsible for guiding the development of City emergency plans and providing overall direction and support for the Emergency Management Program. The membership of this committee is illustrated on the following page.

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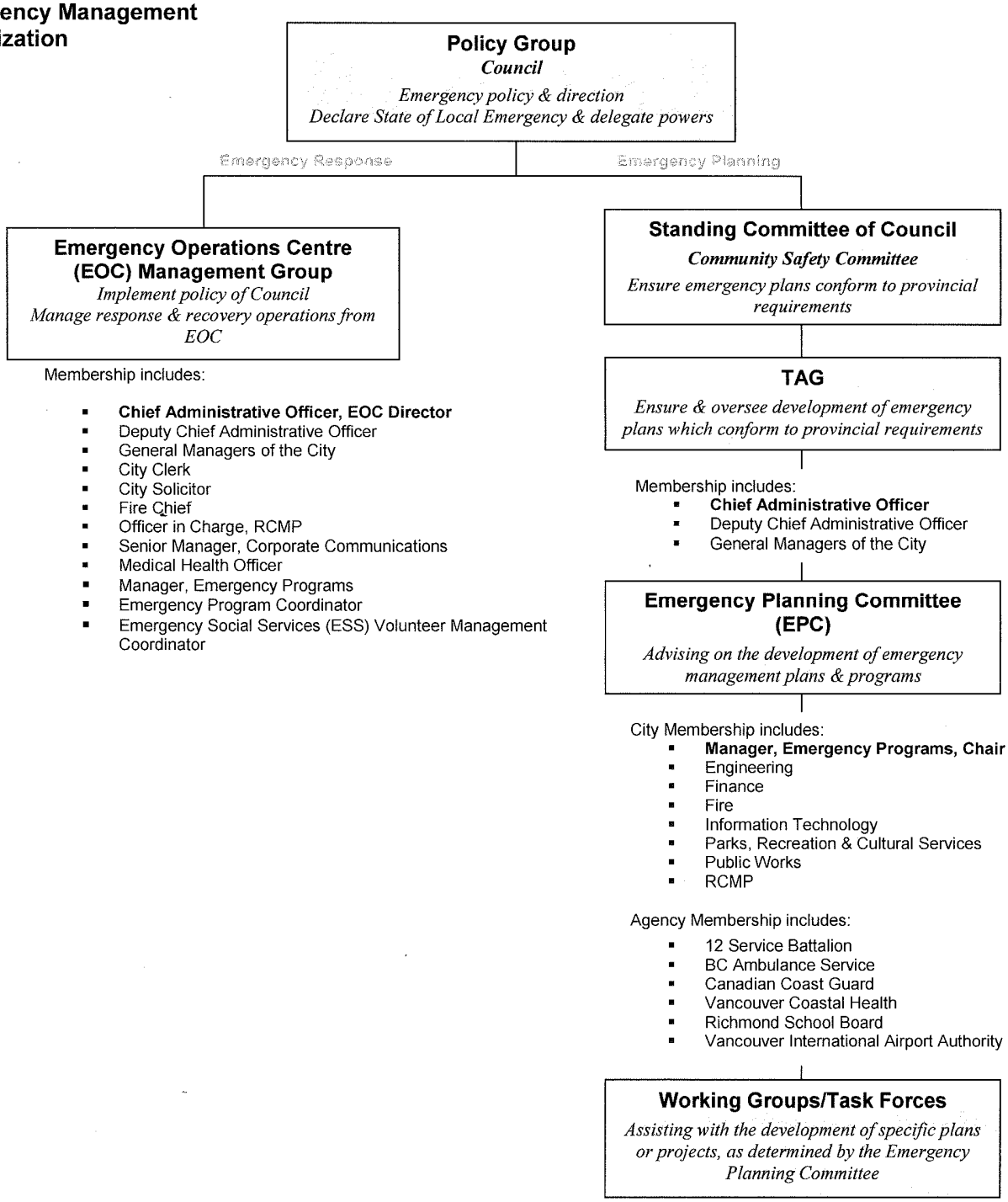
Figure 1
Emergency Management Organization



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3.2 Regional Emergency Planning

The Emergency Management Office works closely with our neighbouring municipalities, the Greater Vancouver Regional District (GVRD) and the Provincial Emergency Program to collaborate on common issues in emergency management, consult on response and cross-jurisdictional protocols and to build a solid working relationship prior to disaster. This approach is facilitated and enhanced by the City's participation on two key committees:

Regional Emergency Planning Committee (REPC)

The Regional Emergency Planning Committee, a subcommittee of the Regional Administrative Advisory Committee (RAAC), is composed of municipal emergency planners throughout the Lower Mainland, utilities, regional health authorities, post secondary institutions, transportation stakeholders, and provincial and federal departments.

The purpose of the REPC is to enhance emergency management through the provision of hazard, risk and vulnerability assessment, mitigation, preparedness, response and recovery information through a collaborative planning process. A common approach to integrated threat and risk management, including communication among first responders, emergency personnel and infrastructure management is critical and a key focus for the REPC.

Integrated Partnership for Regional Emergency Management (IPREM)

The Integrated Partnership for Regional Emergency Management (IPREM) is a governance model that: integrates a layered approach bringing together local, sub-regional, regional and provincial involvement to emergency management; includes legislation that encourages and facilitates integrated regional emergency planning; enables the GVRD to manage their assets in emergencies; coordinates regional emergency planning and supports post disaster recovery; and recognizes and formalizes the province's role in emergency management and ensures there is an approach that uses local resources to facilitate community, regional and provincial communication, collaboration and decision making.

It provides for services of regional emergency management, planning and coordination, including:

1. Developing or assisting in the development of strategies, plans and programs for the prevention of, the preparation for, the response to and recovery from regional emergencies;

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2. Assisting in or supporting and coordinating the management and implementation of the plans, strategies and programs and the preparation for, response to and recovery from regional emergencies; and

3. Assisting in or establishing, operating and maintaining regional emergency facilities.

3.3 Emergency Management Program

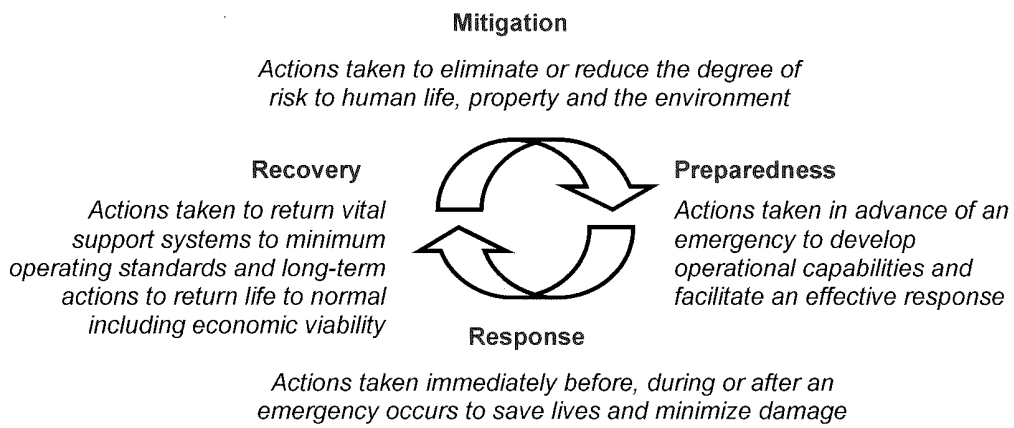
Emergency Management Office

As part of the Law & Community Safety Department, the Emergency Management Office (EMO) consist of a Manager, Emergency Programs, an Emergency Programs Coordinator, an Emergency Social Services and Volunteer Management Coordinator and an Emergency Programs Assistant.

The role of the EMO is to facilitate the development of emergency plans and systems to maximize the protection of life, public infrastructure, private property and the environment in the event of an emergency or disaster situation. This is accomplished by working closely with first responders, agencies and City departments to develop plans and programs which address each stage of the emergency management cycle.

Figure 2

Emergency Management Cycle



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3.3.1 Mitigation

Hazard Risk & Vulnerability Analysis

To date, Richmond's approach to threat analysis has included identification of the major threats affecting our community and conducting detailed studies on a project-specific basis for key aspects of the City's infrastructure or other areas of interest as directed by Council or otherwise determined necessary by the department responsible.

As stated in the Local Authority Emergency Management Regulation, the City is responsible for determining "the potential emergencies and disasters that could affect all or any part of the jurisdictional area for which the local authority has responsibility, and the local authority's assessment of the relative risk of occurrence and the potential impact on people and property". A comprehensive Hazard, Risk and Vulnerability Analysis was completed in 2008.

Public Education

The goal of the program is to build a disaster resilient community, by assisting individuals, families and businesses with their emergency preparations. Key messages are delivered through a variety of mediums to help residents understand the risks, develop personal and business emergency plans, and take action to prepare. Components of the community awareness program include:

- *Emergency preparedness workshops* focus on the key hazards threatening our community and outline the preparations families should undertake to be prepared to be on their own for a minimum of 72 hours and up to 7 days following a major emergency.
- *Business Preparedness* is designed to assist businesses, typically health and safety committees, with their emergency and business continuity planning strategies. Presentations are offered as an orientation on the City's Emergency Program, best practices in business planning and to address specific issues. Our comprehensive Business Disaster Response and Recovery Guide (http://www.richmond.ca/safety/prepare/howto/business.htm) offers detailed checklists, lists of suggested emergency supplies, sample response team procedures and an exercise for businesses.
- *Specialized Publications* such as Richmond's Earthquake and Flood brochures answer frequently asked questions about level of risk, mitigation programs, response planning and general preparedness, are available in the Emergency Management Office or online at http://www.richmond.ca/safety/prepare/city/hazards.htm.

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- *City website* (www.richmond.ca/emergency) provides detailed emergency preparedness information to conveniently help residents and businesses prepare.

3.3.2 Preparedness & Response

Emergency Operations Centre (EOC)

The primary EOC is located at City Hall, the alternate EOC is at the City's Public Works Yard. The EOC is a facility where the EOC Management Group, key City personnel and other response agencies gather to provide policy direction to the on-site incident commander, co-ordinate resource requests from the site and manage all media relations, public information and non-site activities. To ensure the EOC is in a constant state of readiness, staff regularly test communications equipment and maintain an inventory of essential supplies.

Emergency Social Services (ESS)
Emergency Social Services are services provided on a short-term basis to preserve the emotional and physical well being of evacuees and response workers in an emergency. ESS is managed by the Emergency Social Services/Volunteer Management Coordinator in the Emergency Management Office. The provincial government, through the Provincial Emergency Program, funds and supports the program; the Emergency Management Office facilitates the development of response procedures, the recruitment, training, coordination and activation of volunteers who provide support to those affected by the emergency.

A major component of an ESS response is the activation of reception centres. Reception Centre(s) will be activated to provide for the immediate needs of evacuees, to provide temporary shelter, and to reunite families that have been separated.

Volunteer Management

Volunteers are the heart of emergency response. Emergency volunteers typically work with families to get them the assistance they need and work with community groups and staff to prepare for emergencies. To support Emergency Social Services and other Emergency Programs initiatives, volunteers become part of a comprehensive volunteer management program which includes: recruitment, screening, training, exercises, coordination and recognition. The management of convergent volunteers during an emergency is also a key component of the Emergency Social Services Program.

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Training & Exercises

As identified in the Local Authority Emergency Management Regulation, training is an essential element of Emergency Management. The goal is to provide appropriate training to staff and volunteers identified with roles and responsibilities in the City's Emergency Management Plans, which will enable them to respond effectively in an emergency.

The Emergency Management Office prepares an annual training and exercise schedule to regularly exercise plans to ensure that staff are familiar with their roles and the responsibilities and the responsibilities of departments and key response agencies and test the validity of emergency procedures, equipment and facilities.

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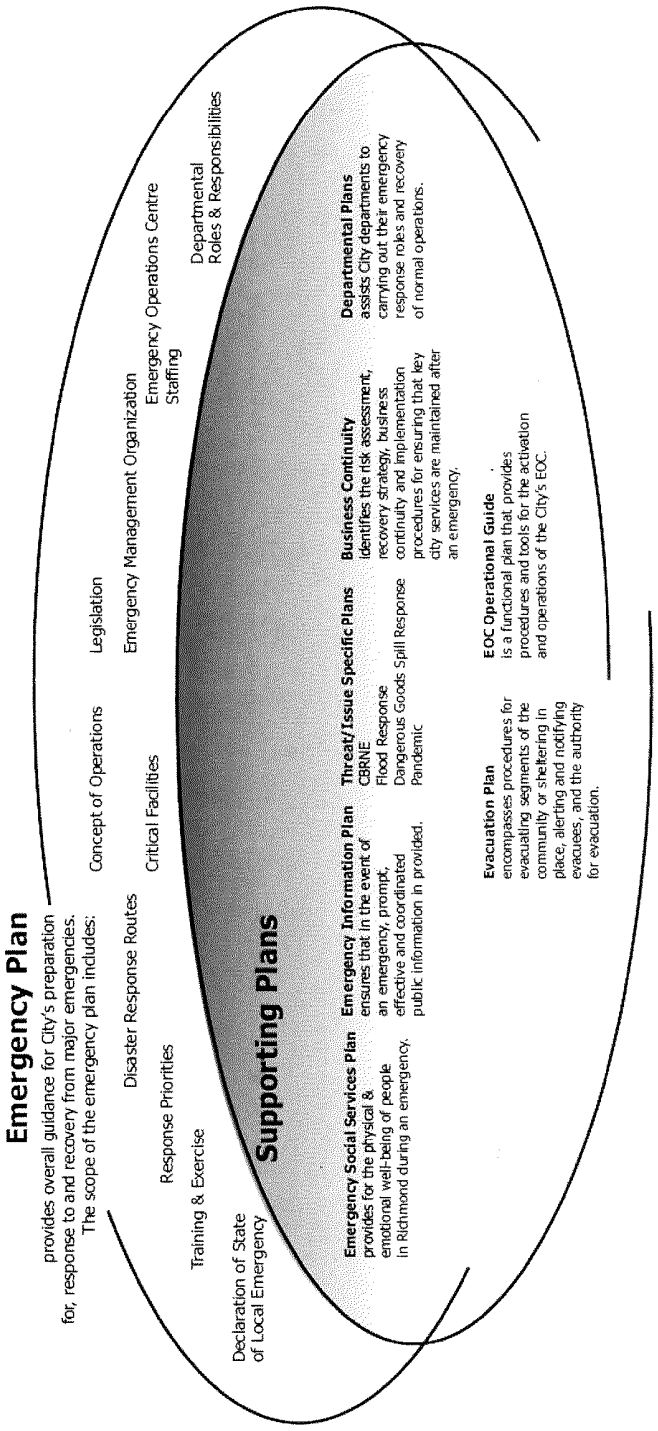
3.3.3 Emergency Plans



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Emergency Management Plan

An administrative document that provides overall direction for the City's preparedness, response and recovery to major emergencies and disasters. Assigns roles and responsibilities to staff that play a critical role in the Emergency Operations Centre and outlines divisional responsibilities.

The Emergency Management Plan is supported by several key documents, which will also be used in guiding our response efforts. Not an exhaustive list, the following supporting plans are annexes to the Emergency Management Plan:

Functional Plans

Functional plans address specific emergency functions, such as evacuation procedures, emergency social services, and the delivery of emergency information.

The Emergency Operations Centre Operations Guide is a key functional plan for the City. It represents the response component of the Emergency Management Plan, providing activation procedures, an organizational chart, detailed checklists for each staff position and forms to be used in the Emergency Operations Centre during a response.

Threat Specific Plans

Threat specific plans focus on specific hazards such as flooding, dangerous goods and CBRNE (Chemical, Biological, Radiological, Nuclear and Explosives) threat. These plans outline the hazard and risk assessment, the response strategy for that specific hazard, response priorities and procedures and roles and responsibilities for multiple agencies, and internal and community resources.

Divisional Plans

Divisional Plans are the responsibility of each division. These plans outline the division's role during an emergency, response priorities and procedures, available resources and staff callout lists, mitigation and recovery strategies.

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Examples of current divisional, functional & threat specific plans are:

Plan	Responsible Department	Status
Archives Disaster Recovery Plan	Archives	Operational
Dangerous Goods Spill Response Plan	Environmental Programs	Operational
Emergency Social Services Plan	Emergency Programs	Operational
Evacuation Plan	Emergency Programs	Operational
Flood Response Plan	Public Works – Roads & Construction	Operational
RCMP Emergency Operations Plan	RCMP	Operational
CBRNE Response Plan	Emergency Programs	Operational
Emergency Information Plan	Corporate Communications	Operational
IT Business Continuity Plan	Information Technology	Operational
Water Services Emergency Response Plan	Public Works – Water Services	Operational
EOC Operations Guide	Emergency Programs	Operational
Richmond Fire Rescue Plan	Richmond Fire Rescue	Operational
Disaster Debris Plan	Environmental Programs	Operational

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4.0 Concept of Operations

4.1 BCEMS

The City of Richmond has adopted the British Columbia Emergency Response Management System (BCEMS) as a comprehensive management system that ensures a coordinated and organized response to emergencies. Endorsed and utilized by the Provincial Government, BCEMS provides the framework for a standardized emergency response for all levels of government in British Columbia.

4.1.1 BCEMS Response Goals

At the foundation of BCEMS are standard response goals, listed in order of priority:

1. Provide for the safety and health of all responders.
2. Save lives.
3. Reduce suffering.
4. Protect public health.
5. Protect government infrastructure.
6. Protect property.
7. Protect the environment.
8. Reduce economic and social losses.

4.1.2 BCEMS Components

Operation & Control

Provides a common organizational structure and control method for the management of personnel, equipment facilities and resources. Enhances communications between agencies in the preparation and implementation of response operations. Details a site response structure based on Incident Command System (ICS), plus three levels of coordinated support and direction.

Qualification

Establishes a standard for the management of each functional area and level with the emergency response management system.

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Technology

Establishes the use of common technology in support of emergency operations.

Training

Mandates the training of designated personnel to meet the established standards.

Publications

Mandates distribution of a common set of forms, reports, instructional terminology and other written material in support of the standard.

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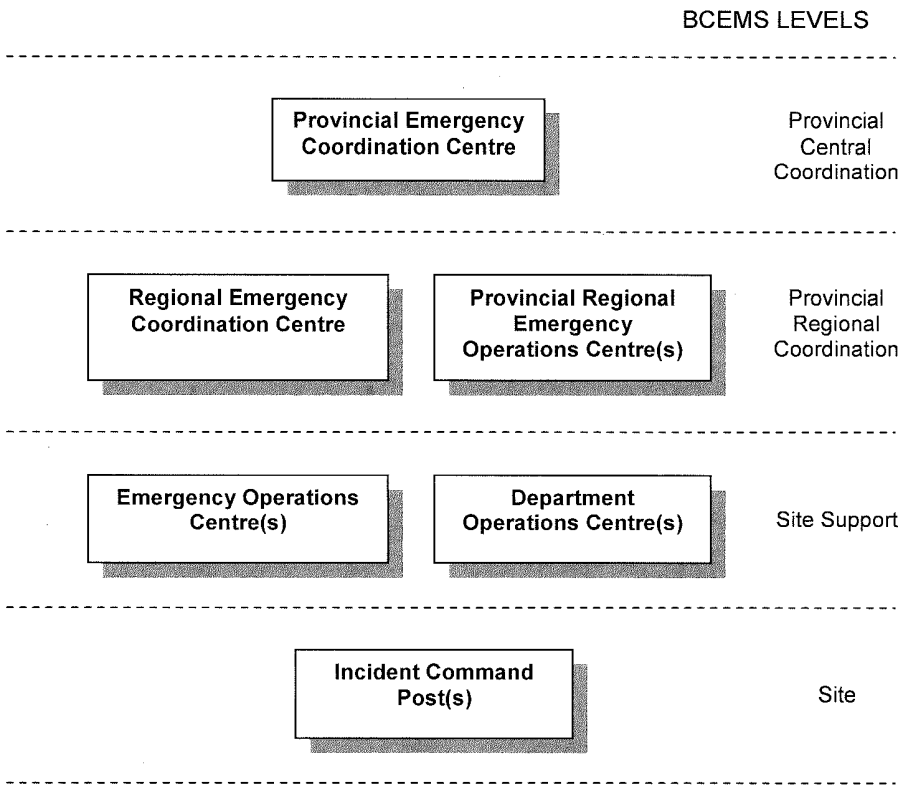
4.1.3 BCEMS Operational Levels



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Site: *Incident Command Post(s)*

The majority of incidents which occur in Richmond, will be managed at the site level by the City's key response agencies, such as Fire, Police, BC Ambulance and Public Works. Following the Incident Command System (ICS), an Incident Command Post (ICP), a location from which the Incident Commander directs the site response to an emergency, will be established. The command post may be a police or fire vehicle, an on-site shelter or the City's Incident Command Post vehicle. Incident objectives, strategies and tactics for the site are formulated and directed from the ICP.

Site Support: *Emergency Operations Centre (EOC)*

In the event that the incident cannot be adequately managed from the site, or there are multiple sites, support will be provided through activation of the Emergency Operations Centre. Members of Council and the Emergency Operations Centre Management Group, as identified in the Emergency Management Organization Establishment Bylaw No. 7898, have the authority to activate the EOC. By Declaration of a State of Provincial Emergency, the Director of the Provincial Emergency Program also has the authority to activate a municipal EOC.

The EOC is a central location where local government officials provide inter-agency coordination, communications, policy guidance, resource acquisition and executive decision-making for coordinating and supporting emergency response and recovery efforts.

The City's primary EOC is located at City Hall with an alternate facility at the Public Works Yard.

Site Support: *Departmental Operations Centre (DOC)*

Some agencies such as RCMP, Richmond Fire Rescue, Canadian Coast Guard or Public Works may require unique local support for their operations and can establish a Department Operations Centre (DOC). A DOC is primarily concerned with supporting the operations of one specific department or agency and ensuring regular activities continue. The DOC will focus on such issues as staff scheduling and obtaining, coordinating and directing highly specialized resources for the agency to fulfil its mission. The relationship between the EOC and the DOC is to provide policy direction and support or assistance in facilitating resources or actions at the request of the DOC Director.

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Provincial Regional Coordination: Provincial Regional Emergency Operations Centre

In incidents of significant magnitude that the City is unable to respond to adequately through the measures outlined above, or, where the incident crosses jurisdictional boundaries, the Provincial Regional Emergency Operations Centre (PREOC) will also be activated. The PREOC coordinates, facilitates and manages information, policy direction, and provincial resources to support local authorities and provincial agencies responding to an emergency or disaster.

Operated by the South West PEP Regional Office, the PREOC is located at 14275 - 96th Avenue, Surrey and in conjunction with the provincial central coordination level, integrates overall provincial support to the community.

The PREOC communicates with the EOC to support operations and assist with coordination of resources and mutual aid requests. The organization and management of a PREOC follows the BCEMS standards.

Provincial Coordination: *Provincial Emergency Coordination Centre*

The Provincial Emergency Coordination Centre (PECC) provides inter-region policy direction and coordination for emergencies involving more than one PREOC. It acts as an overall provincial coordination centre in the event of simultaneous multi-region disasters, such as earthquakes, floods or interface fires. The PECC also serves as the coordination and communications link with the federal disaster support structure, working with both the Department of National Defence and Public Safety Canada.

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4.1.4 BCEMS Functions

Based on the Incident Command System (ICS), the BCEMS framework is divided into five functions and is used at all operational levels:

Function	Role
Management	Responsible for overall emergency policy and coordination; public information and media relations; agency liaison; and proper risk management procedures, through the joint efforts of local government agencies and private organizations.
Operations	Responsible for coordinating all jurisdictional operations in support of the emergency response through implementation of the jurisdiction's Action Plan.
Planning	Responsible for collecting, evaluating, and disseminating information; developing the jurisdiction's Action Plan and Situation Status in coordination with other functions; maintaining all EOC documentation.
Logistics	Responsible for providing facilities, services, personnel, equipment and materials
Finance/Administration	Responsible for financial activities and other administrative aspects.

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5.0 Emergency Operations Centre Roles & Responsibilities

Richmond's EOC is located at City Hall with an alternate facility at the Public Works Yard.

5.1 Authorization

The following individuals may authorize activation of the EOC:

1. Mayor
2. Members of the Emergency Operations Centre Management Group (EOC Management Group), or their designate, as follows:
    - Chief Administrative Officer
    - Deputy Chief Administrative Officer
    - General Managers of the City
    - Director, City Clerk's Office
    - City Solicitor
    - Fire Chief
    - Police Chief
    - Manager, Emergency Programs
    - Senior Manager, Corporate Communications
    - Medical Health Officer
    - Emergency Programs Coordinator
    - Emergency Social Services and Volunteer Management Coordinator

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5.2 Activation

The EOC may be activated if one or more of the following criteria apply:

- Significant number of people at risk.
- Response coordination required because of large or widespread event.
- Multiple emergency sites.
- Several responding agencies.
- Resource coordination required because of limited local resources and/or significant need for outside resources.
- Uncertain conditions or extent of damage.
- Possibility of escalation of the event.
- Potential threat to people, property and/or environment.
- Declaration of a State of Local Emergency is made.

Declaration Not Required

The EOC may be activated with or without a Declaration of a State of Local Emergency; however, it is recommended that it be activated in the event that a Declaration has been made.

5.2.1 EOC Activation Levels

The level of EOC activation is determined by the magnitude and scope of the event. Only those EOC functions and positions that are required to meet current response objectives are activated. If staff are not assigned to a function or role, the next available staff position in the EOC organization will assume responsibility and the tasks assigned. If an individual is unsure of which level to activate, the EOC is activated to the higher level since it is easier to scale back than to ramp up.

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EOC Activation Levels

Activation Level	Event/Situation	Minimum Staffing Requirements
One	• Small event; One site • Two or more agencies involved • Potential threat of: Flood, Severe storm, Interface fire	• EOC Director • Information Officer • Liaison Officer • Operations Section Chief • PEP Notified
Two	• Moderate event; Two or more sites • Several agencies involved • Major scheduled event (eg conference or sporting event) • Limited evacuations • Some resources/support required	• EOC Director • Information Officer • Liaison Officer • Risk Mgmt Officer • Section Chiefs (as required) • PEP / PREOC limited activation
Three	• Major event; Multiple sites • Regional Disaster • Multiple agencies involved • Extensive evacuations • Resources/support required	• All EOC functions and positions (as required) • Policy Group • PREOC activation

- Taken from the Emergency Operations Centre Operational Guidelines, Government of BC website

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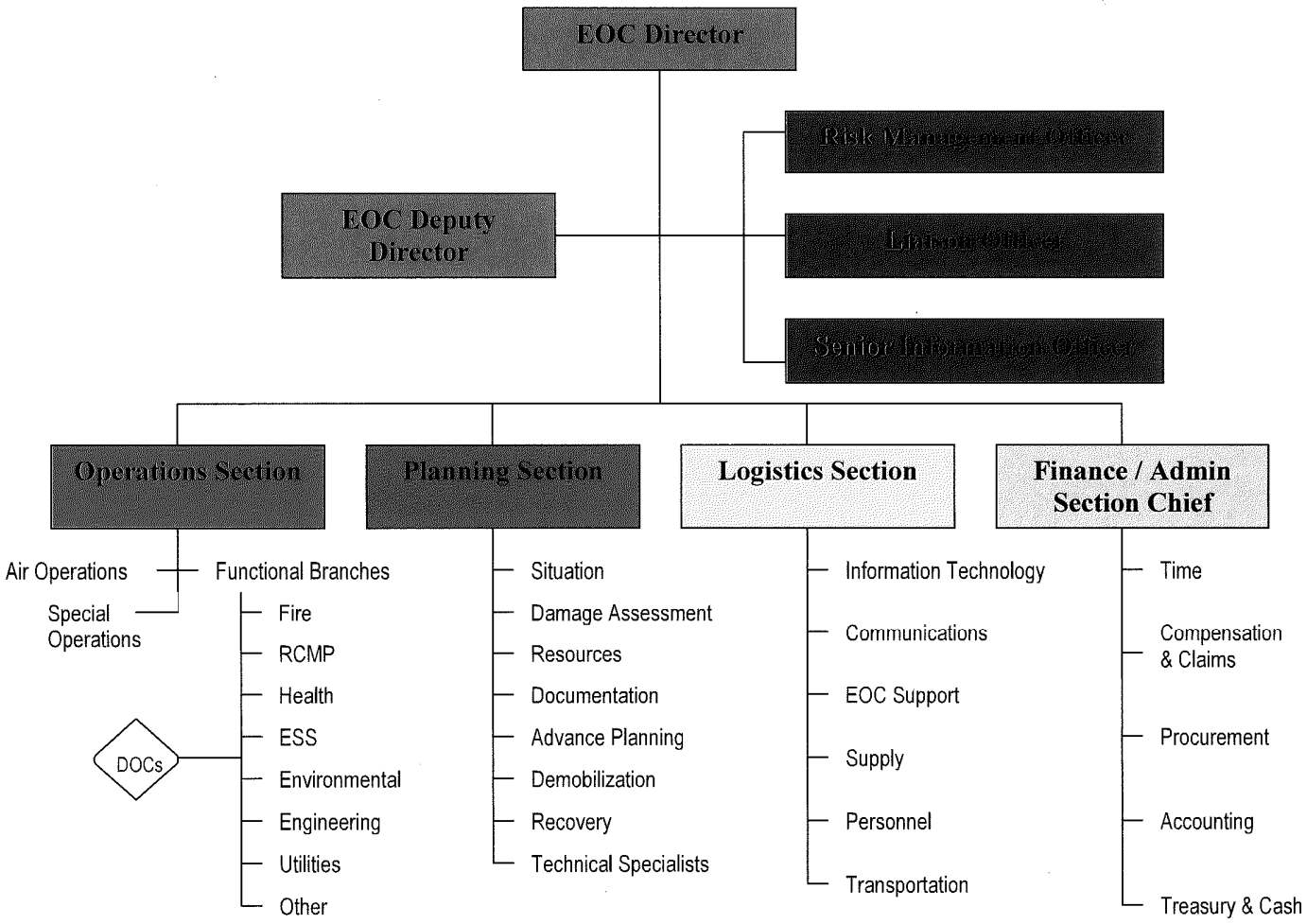
Richmond

Emergency Management Plan



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5.3 Notification

The Mayor or a member of the EOC Management Group will notify Public Works Dispatch by calling (604) 270-8721. If telephone lines are down, Dispatch can be notified in person or via radio. Dispatch will then notify the EOC set up team and EOC members. Detailed notification procedures are available in the EOC Operations Guide.

5.4 Deactivation

The EOC Director is responsible for EOC deactivation. The Director considers the requirements of termination from the outset. Criteria for terminating EOC operations may include:

- Individual EOC functions are no longer required.
- State of Local Emergency is lifted.
- Coordination of response activities and/or resources is no longer required.
- Event has been contained and emergency personnel have returned to regular duties.

The Planning Section's Demobilization Unit Coordinator in the EOC supervises and administers the termination process.

5.5 Emergency Operations Centre Staff

The following organizational chart outlines key roles within the EOC and their general roles and responsibilities. The EOC Management Group has the authority to activate the EOC and is responsible for assigning the appropriate staff to these positions based on the type and duration of emergency.

The EOC organizational structure is flexible and can expand and contract as needed. EOC staff may be required to take on more than one position (role), as determined by the nature of the emergency event, availability of resources and/or as assigned by a Section Chief. Administration staff are critical to the smooth and efficient operation of the EOC and will be called to respond as required.

Positions within the EOC may differ significantly from regular City work positions. Due to the unpredictable nature of emergencies, it is vitally important that EOC staff adopt an attitude of flexibility and teamwork to get the required job done.

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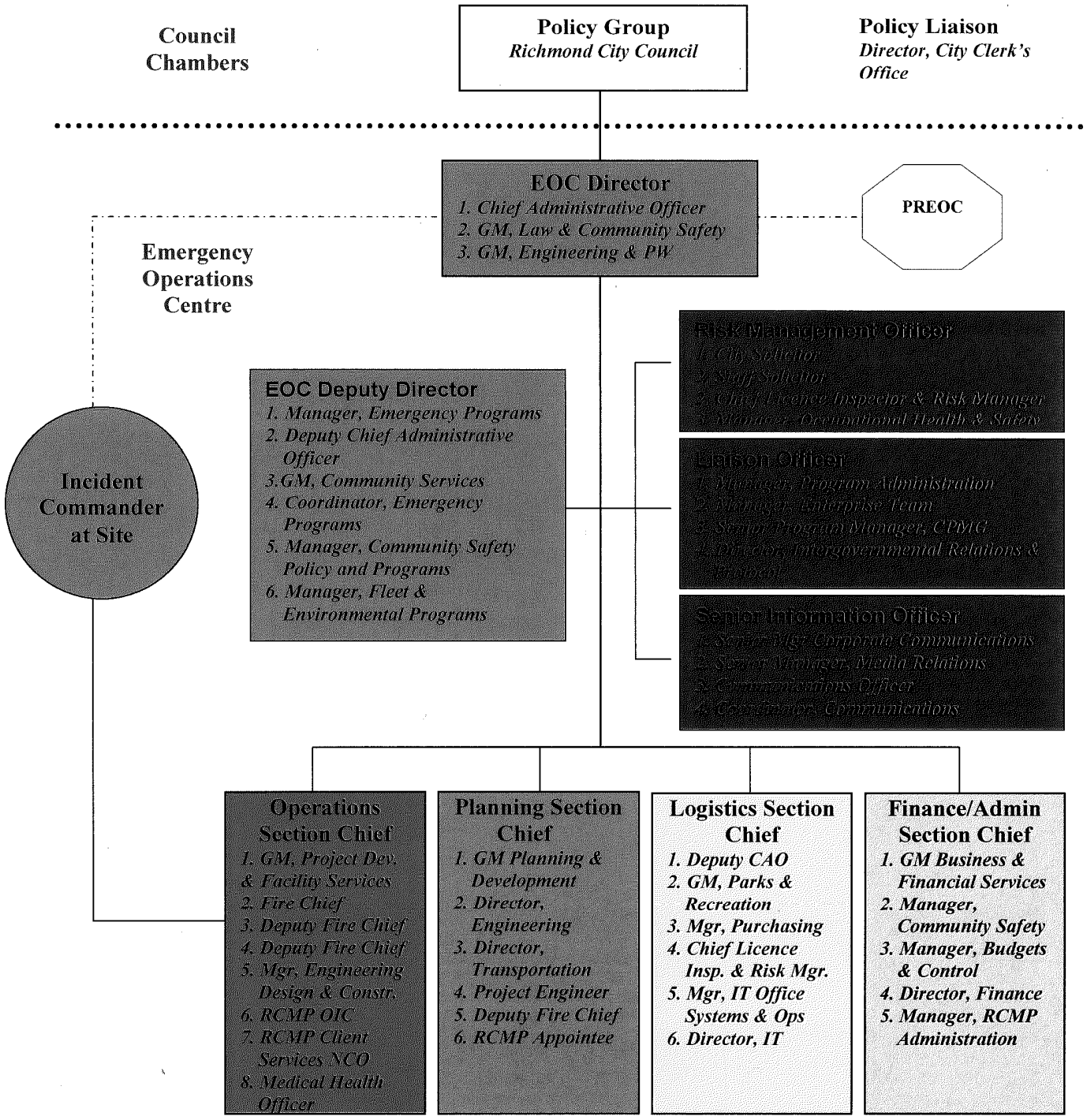
5.5.1 EOC Organization Chart



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Roles & Responsibilities: EOC Management Group

Emergency Position	Regular Position	Reporting to	Responsibilities
Policy Group	**Mayor** **Council**	**City Hall, Anderson Room/Council Chambers**	• Provides overall emergency policy and direction to the EOC Director. • Set expenditure limits. • Establishes appropriate emergency legislation and policies, as required. • Authorizes declaration and termination of a "State of Local Emergency", if required. • Provides direction for emergency public information activities • acts as spokesperson for the jurisdiction.
Policy Liaison	**Director, City Clerk's Office**	**City Hall, Anderson Room/Council Chambers**	• Provide guidance to Mayor and Council in declaring a state of local emergency and other required policies. • Act as the policy liaison for the Policy Group and EOC Director.
EOC Director	**CAO, or** **GM, Law & Community Safety** **GM, Engineering & Public Works**	**Emergency Operations Centre** *Policy Group*	• Exercise overall management responsibility for the coordination between emergency response and supporting agencies in the EOC. In conjunction with Incident Commander(s) and EOC Management Staff, set priorities for response efforts in the affected area. • Establish the appropriate staffing level for the EOC and continuously monitor organizational effectiveness to ensure that appropriate modifications occur as required. • Direct, in consultation with the Information Officer, appropriate emergency public information actions using the best methods of dissemination. Approve the issuance of press releases, and other public information materials as required. • Liaise with Policy Group and/or Elected Officials.
EOC Deputy Director	**Manager, Emergency Programs** **Deputy CAO** **GM, Community**	**Emergency Operations Centre** *EOC Director*	• Assume the role of an EOC Director in his/her absence. • Undertake special assignments at the request of the EOC Director. • Ensure the efficient and effective flow of information within the EOC. • Ensure resource requests are prioritized and

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Emergency Position	Regular Position	Reporting to	Responsibilities
	Services **Coordinator, Emergency Programs** **Manager, Community Safety Pol. & Programs** **Manager, Fleet & Environmental Programs**		tracked. • Support EOC management by communicating policy direction and action priorities to all staff. • Coordinate internal functions of EOC for effective operational capability. • Monitor the health and welfare of EOC staff. Mediate and resolve any personnel conflicts. • Facilitate shift change briefings and operational debriefings.
Risk Management Officer	**City Solicitor** **Staff Solicitor** **Chief Licence Inspector & Risk Manager** **Manager, Occupational Health & Safety**	**Emergency Operations Centre** *EOC Director*	• Ensure good risk management practices are applied throughout the response organization and that every function contributes to the management of risk. • Protect the interests of all EOC participants, agencies, and organizations by ensuring due diligence in information collection, decision-making, and implementation. • Monitor situation for risk exposures and ascertain probabilities and potential consequences of future events. • Provide advice on safety issues. Has the authority to halt or modify any and all unsafe operations within or outside the scope of the EOC Action Plan, notifying the EOC Director of actions taken. *Note: w*hile the Risk Management Officer has responsibility for safety, it is recommended that a safety specialist be appointed who is familiar with all aspects of safety and relevant legislation. • Ensure that appropriate security measures have been established to allow for only authorized access to the EOC facility and documentation.
Liaison Officer	**Manager, Program Administration** **Manager,**	**Emergency Operations Centre** *EOC Director*	• Point of contact for, and interaction with, representatives from other agencies arriving at the EOC. • Liaise with other local authorities' EOCs, Provincial and Federal organizations,

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Emergency Position	Regular Position	Reporting to	Responsibilities
	Enterprise Team **Senior Program Manager, CPMG** **Director, Intergovernmental Relations & Protocol**		communicating EOC guidelines, directives, Action Plans and situation information. • Liaise with any DOCs (Department Operation Centres), PREOC, ECCs (Emergency Coordination Centres), and organizations not represented in the EOC. • Coordinate agency representatives for the EOC as required to ensure adequate EOC structure, and fill all necessary roles and responsibilities enabling the EOC to function effectively and efficiently. • Assist and serve as an advisor to the EOC Director and Management Team as needed, providing information and guidance related to the external functions of the EOC. • Assist the EOC Director in ensuring proper procedures are in place for directing agency representatives, communicating with elected officials, and conducting VIP/visitor tours of the EOC facility.
Senior Information Officer	**Senior Manager, Corporate Communication** **Senior Manager, Media Relations** **Communication Officer** **Coordinator, Communications**	**Emergency Operations Centre** *EOC Director*	• Coordination point for all public information, media relations, and internal information sources for the EOC. **Public Information** • Coordinate and supervise all staff assigned as Public Information Officers and their activities. • Call Centre: ensure that the public receives complete, accurate, and consistent information about life safety procedures, public health advisories, relief and assistance programs, and other vital information. • Ensure that a Toll-Free Public Information Service (hot line or call centre) is established for the public to access helpful information and advice. Provide the call takers with timely and accurate messaging sheets so that they offer only confirmed and approved information. **Media Relations** • Serve as the coordination point for all media releases for the EOC. • Coordinate media releases with officials representing other affected emergency response

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Emergency Position	Regular Position	Reporting to	Responsibilities
			agencies. • Develop the format for press conferences and briefings in conjunction with the EOC Director. • Maintain a positive relationship with the media representatives, monitoring all broadcasts and written articles for accuracy. **Internal Information** • In consultation with EOC Director and Liaison Officer, coordinate VIP and visitor tours of the EOC facility. • Develop helpful messaging sheets and/or FAQ sheets (frequently asked questions and answers) to ensure consistent and accurate information sharing amongst EOC staff. • Maintain a web site established for EOC information, as appropriate. • Liaise with the Information Officers at site, other EOCs, DOCs, PREOC, and other external agencies.
Operations Section Chief	**GM, Project Development & Facility Services** **Fire Chief** **Deputy Fire Chief** **Deputy Fire Chief** **Manager, Engineering Design & Construction** **Officer in Charge, RCMP** **Client Services NCO, RCMP** **Medical Health**	**Emergency Operations Centre** *EOC Director*	• Supervise the Operations Section • Ensure that the Operations function is carried out including coordination of response for all operational functions assigned to the EOC. • Ensure that Operations objectives and assignments identified in the EOC Action Plan are carried out effectively. • Establish the appropriate level of branch and unit organizations within the Operations Section, continuously monitoring the effectiveness and modifying accordingly. • Coordinate any activated DOCs in the operational area. • In consultation with Planning Chief, clearly define areas of responsibility between the Operations and Planning Sections. • Maintain a communications link between Incident Commanders (sites), and the EOC for the purpose of coordinating the overall response, resource requests, and event status information. • Ensure that the Planning Section is provided with Branch Status Reports and Major Incident

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Emergency Position	Regular Position	Reporting to	Responsibilities
	Officer		Reports. • Conduct periodic Operations briefings for the EOC Director and Management team as required or requested.
Planning Section Chief	**GM, Planning & Development** **Director, Engineering** **Director, Transportation** **Project Engineer** **Deputy Fire Chief** **RCMP Appointee**	**Emergency Operations Centre** *EOC Director*	• Establish the appropriate level of organization for the Planning Section. • Coordinate document control. • Collect, analyze, and display situation information. • Prepare periodic Situation Reports. • Prepare and distribute EOC Action Plan and facilitate Action Planning process. • Track resources. • Conduct Advance Planning activities and report. • Document and maintain files on all EOC activities. • Provide technical support services to the various EOC sections and branches. • Exercise overall responsibility for the coordination of branch/unit activities within the section. • Consult with the Operations Chief to clearly define areas of responsibility between the Operations and Planning Sections. • In coordination with the other Section Chiefs, ensures that Status Reports are completed and utilized as a basis for EOC Situation Reports, and EOC Action Plans.
Logistics Section Chief	**Deputy CAO** **GM, Parks & Recreation** **Manager, Purchasing** **Chief Licence Inspector & Risk Manager** **Manager, IT**	**Emergency Operations Centre** *EOC Director*	• Supervise the Logistics Section of the EOC, establish the appropriate level of branch and/or unit staffing within Logistics section. • Provide telecommunication services and information technology. • Locate or acquire equipment, supplies, personnel, facilities, and transportation as requested. • Arrange for food, lodging, and other support services as required both for the EOC and site requirements. • Ensure section objectives as stated in the EOC Action Plan are accomplished within the

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Emergency Position	Regular Position	Reporting to	Responsibilities
	Office Systems & Operations **Director, IT**		operational period or within the estimated time frame. • Coordinate closely with the Operations Section Chief to establish priorities for resource allocation within the operational area. • Ensure critical resources are allocated according to EOC Action Plan, policy, priorities and direction. • Coordinate with ESS Branch Coordinator on the provision of food and lodging for EOC and Site Personnel.
Finance/ Administration Section Chief	**GM, Business & Financial Services** **Manager, Community Safety** **Manager, Budgets & Control** **Director, Finance** **Manager, RCMP Administration**	**Emergency Operations Centre** *EOC Director*	• Supervise the Finance/Administration Section. • Activate units within the Finance/Administration Section as required, modify as needed. • Ensure that all financial records are maintained throughout the event or disaster. • Ensure that all on-duty time is recorded and collected for all personnel. • Ensure continuum of payroll process for all employees responding to the event or disaster. • In consultation with EOC Director, determine spending limits for Logistics, Operations, and Management Staff. • Ensure that workers' compensation claims, resulting from the response are processed within a reasonable time, given the nature of the situation. • Ensure that all travel and expense claims are processed within a reasonable time, given the nature of the situation. • Ensure that all recovery documentation and Disaster Financial Assistance paperwork is accurately maintained and submitted to PEP.

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Emergency Operations Centre - Operations Section

Emergency Position	Reporting to	Responsibilities
Air Operations Branch Coordinator	**Emergency Operations Centre** *Operations Section Chief*	• Organize aviation resources at the local level to support site operations. • As appropriate, initiate requests for Notice to Airmen (NOTAM). • Establish procedures for emergency reassignment of aircraft if required. • Coordinate with any provincial or regional authority's Air Operations in the operational area. • Liaise with Air Operations at the PREOC.
Special Operations Branch Coordinator	**Emergency Operations Centre** *Operations Section Chief*	• Organize specialized resources at the site support (EOC) level to support site activities. • As appropriate, initiate requests for Notice to Mariners. • Establish procedures for emergency reassignment of specialized resources such as Heavy Urban Search and Rescue, if required. • Coordinate with any regional or provincial special operations in the operational area. • Liaise with Special Operations at the PREOC.
Fire Branch Coordinator	**Emergency Operations Centre** *Operations Section Chief*	• Arrange and coordinate for urban fire suppression, as well as hazardous materials support operations. • Conduct damage assessment of fire halls and resources. • Assist with the cursory assessment of community damage as assigned in the EOC Action Plan. • Acquire mutual aid resources, as necessary. • Coordinate the mobilization and transportation of all resources through the Logistics Section. • Complete and maintain branch status reports for major incidents requiring or potentially requiring regional and provincial response support, and maintain status of unassigned fire and HAZMAT resources in the area in conjunction with the Resource Unit. • Implement the objectives of the EOC Action Plan assigned to the Fire Branch. • Overall supervision of the Fire Branch.
RCMP Branch	**Emergency Operations**	• Coordinate movement and evacuation operations with

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Emergency Operations Centre - Operations Section

Emergency Position	Reporting to	Responsibilities
Coordinator	**Centre** *Operations Section Chief*	other Operations Section Branches. • Alert and notify the public of impending or existing emergency situations, public safety orders, requests and information within the jurisdiction, as required. • Coordinate law enforcement and traffic control operations, including evacuation, during a major emergency and control of disaster response routes as designated by EOC Director. • Coordinate all ground and inland water search and rescue operations and resource for the jurisdiction. • Coordinate Police Mutual Aid requests. • Supervise the Police Branch.
Ambulance Branch Coordinator	**Emergency Operations Centre** *Operations Section Chief*	• Assist in identifying and mobilizing available ambulance and auxiliary ambulance resources, as required. • Coordinate the transportation of injured victims and health care personnel to appropriate medical facilities, as required.
Health Branch Coordinator	**Emergency Operations Centre** *Operations Section Chief*	• Ensure coordination of hospitals, health units, continuing care, mental health, and environmental health within the area. • Assist the BCAS Unit Coordinator in ensuring that casualties are evenly distributed to receiving facilities. • Coordinate provision of public health measures including epidemic control and immunization programs, in consultation with Medical Health Officer. • Ensure that potable water supplies are inspected and monitored. • Ensure that food quality is regulated and inspected. • Ensure that sewage systems are operating at acceptable levels. • Coordinate and support health services for physically challenged or medically disabled persons. • Coordinate the activation of emergency hospitals and advanced treatment centres supplied by Health Canada. • Coordinate health care needs at Reception Centres with ESS Branch Coordinator. • Determine the status of medical and care facilities within the affected area and availability of facilities in surrounding

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Emergency Operations Centre - Operations Section

Emergency Position	Reporting to	Responsibilities
		area. • Assists with the transportation of injured victims and health care personnel to appropriate medical facilities, as required. • Assist with the coordination of pharmaceuticals, as required. • Assist with the coordination of other health care resources, as required. • Liaise with Health Branches activated in other EOCs and at PREOC.
Environmental Branch Coordinator	**Emergency Operations Centre** *Operations Section Chief*	• Assist and/or coordinate local response to hazardous spills, waste disposal, and dam failure. • Liaise with regional, provincial, and federal environment officials and the private sector.
Emergency Social Services Branch Coordinator	**Emergency Operations Centre** *Operations Section Chief*	• Manages the ESS Branch, identifying required ESS services and activating ESS Reception Centres & volunteers to provide essential services to people evacuated as a result of the emergency event. • In coordination with volunteer and private agencies, provide food, clothing, shelter and other essential services, as required, for disaster victims and response workers in the area. • Coordinates the activities of ESS Reception Centres, group lodging facilities, and ESS Volunteer Centres. • Provides routine situation reports to Operations Section Chief, Situation Unit, and Provincial Emergency Program. • Shares information and provides ESS mutual aid (upon request) with other affected communities in the region. • Requests mutual aid assistance and/or provincial ESS resources from Provincial Emergency Program when local and/or regional ESS resources are exhausted. This may include access to provincial ESS Mobile Support Teams. • Confers with Operations Section Chief and EOC Director to ensure that ESS response is appropriate and that expenditures for ESS are authorized.
Engineering Branch	**Emergency Operations**	• Survey all other infrastructure systems, such as local roads, bridges, sewer, and water systems within the area.

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Emergency Operations Centre - Operations Section

Emergency Position	Reporting to	Responsibilities
Coordinator	**Centre** *Operations Section Chief*	• Assist other EOC sections, branches, and units as needed. • Supervise the Engineering Branch. • Liaise with other Engineering Branches in EOCs and PREOC.
Public Works Branch Coordinator	**Emergency Operations Centre** *Operations Section Chief*	• Work closely with the Engineering Branch to survey all other infrastructure systems, such as local roads, bridges, sewer, and water systems within the area. • Establish group coordinators for service areas, such as Public Works and Inspections, as required. • Assist other EOC sections, branches, and units as needed. • Work with the appropriate Operations and Logistics sections regarding the provision of potable water and water for fire fighting. • Supervise the Public Works Branch. • Liaise with other Engineering Branches in EOCs and PREOC.
Building Branch Coordinator	**Emergency Operations Centre** *Operations Section Chief*	• Establish priorities for damage assessment starting with City's critical facilities. • Survey local buildings, assessing the damage and coordinating the repair of damage. • Establish coordinators to survey facilities, as required.
Utilities Branch Coordinator	**Emergency Operations Centre** *Operations Section Chief*	• Survey all utility systems and provide restoration priorities to providers. • Assist other sections, branches, and units as needed. • Liaise with other utility representatives not present in EOC.

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Emergency Operations Centre – Planning Section

Emergency Position	Reporting to	Responsibilities
Situation Unit Coordinator	**Emergency Operations Centre** *Planning Section Chief*	• Oversee the collection, organization, and analysis of disaster situation information, including damage assessments. • Ensure that information collected from all sources is validated. • Ensure that Situation Reports are developed for dissemination to EOC staff and to the PREOC. • Ensure that an EOC Action Plan is developed for each operational period based on objectives developed by each EOC Section. • Ensure that an ongoing link is established with the Operations Section for the purpose of collecting accurate situation information in a timely manner. • Ensure that all maps, status boards, and other displays contain current and accurate information.
GIS Coordinator	**Emergency Operations Centre** *Planning Section Chief*	• Coordinate with other sections, primarily Operations and Logistics, to determine mapping requirements. • Coordinate the design and distribution of maps.
Resource Unit Coordinator	**Emergency Operations Centre** *Planning Section Chief*	• Coordinate with the branches and units in the Operations and Logistics Sections to capture and centralize resource status information. Note: This position tracks resources, it does not obtain or supply them. • Develop and maintain resource status boards, and/or other tracking and display systems.
Documentation Unit Coordinator	**Emergency Operations Centre** *Planning Section Chief*	• Collect, organize and file all completed event or disaster related forms, including: all EOC position logs, Situation Reports, EOC Action Plans, and any other related information just prior to the end of each operational period. • Provide document reproduction services to EOC staff. • Distribute the EOC Situation Reports, EOC Action Plan, and other documents, as requested. • Maintain a permanent archive of all Situation Reports and EOC Action Plans associated with the event or disaster. • Assist Recovery Unit with preparation and distribution of the EOC After Action Report.

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Emergency Operations Centre – Planning Section

Emergency Position	Reporting to	Responsibilities
Advance Planning Unit Coordinator	**Emergency Operations Centre** *Planning Section Chief*	• Develop an Advance Plan consisting of potential response and recovery related issues likely to occur beyond the next operational period, generally within 36 to 72 hours. • Review all available Situation Reports, Action Plans, and other significant documents. Determine potential future impacts of the event or disaster, particularly issues that might modify the overall EOC priorities and objectives. • Provide periodic briefings for the EOC Director and Management Team addressing Advance Planning issues. • Supervise the Advance Planning Unit.
Demobilization Unit Coordinator	**Emergency Operations Centre** *Planning Section Chief*	• Develop a Demobilization Plan for the EOC based on a review of all pertinent Planning Section documents, and Situation Reports, and status of EOC priorities and objectives. • Supervise personnel assigned to the Demobilization Unit.
Recovery Unit Coordinator	**Emergency Operations Centre** *Planning Section Chief*	• Assess the requirements for recovery of City infrastructure and for community and individual recovery from a major emergency or disaster. • Identify immediate steps (short-term relief efforts) that can be taken to initiate and speed recovery within the area. • Anticipate actions required over the long term to restore local services and return the area to pre-emergency conditions. • Supervise the Recovery Unit and all recovery operations unless otherwise directed by the Planning Section Chief and/or EOC Director.
Business Continuity Coordinator	**Emergency Operations Centre** *Planning Section Chief*	• Assess the requirements for the resumption of City business functions, as well as local businesses. • Working with key City departments, develop a strategy for resuming the City business functions as quickly as possible.
Technical Specialists Unit Coordinator	**Emergency Operations Centre** *Planning Section*	• Provide technical observations and recommendations to the EOC in specialized areas, as required. • Ensure that qualified specialists are available in the areas required by the particular event or disaster.

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Emergency Operations Centre – Planning Section

Emergency Position	Reporting to	Responsibilities
	Chief	• Supervise the Technical Specialists Unit.

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Emergency Operations Centre - Logistics Section

Emergency Position	Reporting to	Responsibilities
Information Technology Branch Coordinator	**Emergency Operations Centre** *Logistics Section Chief*	• Ensure computer resources and services are provided to EOC staff, as required. • Determine specific computer requirements for all EOC functions and positions. • Implement available computer systems for internal information management and include message and e-mail systems, as available. • Supervise the Information Technology Branch.
Communications Branch Coordinator	**Emergency Operations Centre** *Logistics Section Chief*	• Ensure radio, telephone, and computer resources and services are provided to EOC staff, as required. • Oversee the installation of communications resources within the EOC. Ensure that a communications link is established with Incident Commander(s), DOCs, other EOCs, PREOC and other facilities, if established. • Develop and distribute a Communications Plan, which identifies all systems in use and lists specific frequencies allotted for the disaster. • Supervise the Communications Branch.
EOC Support Branch Coordinator	**Emergency Operations Centre** *Logistics Section Chief*	• Ensure that facilities are provided for the response effort, including securing access to the facilities and providing staff, furniture, supplies, and materials necessary to configure the facilities appropriately. • Ensure food and refreshments are provided to EOC staff. • Ensure security measures are taken to secure all facilities from access by unauthorized people. • Ensure acquired buildings, building floors, and or workspaces are returned to their original state when no longer needed. • Supervise the EOC Support Branch.
Supply Branch Coordinator	**Emergency Operations Centre** *Logistics Section Chief*	• Oversee the acquisition and allocation of supplies and materials not normally provided through mutual aid or normal agency channels. • Coordinate actions with the Finance /Administration Section. • Coordinate delivery of supplies and materials, as required.

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Emergency Operations Centre - Logistics Section

Emergency Position	Reporting to	Responsibilities
		• Allocate critical resources as required and directed. • Supervise the Supply Branch.
Personnel Branch Coordinator	**Emergency Operations Centre** *Logistics Section Chief*	• Provide personnel resources as requested in support of the EOC and Site Operations. • Identify, recruit, and register staff and volunteers, as required. • Develop an EOC organization chart. • Supervise the Personnel Branch.
Transportation Branch Coordinator	**Emergency Operations Centre** *Logistics Section Chief*	• In coordination with the Engineering Branch Coordinator, and Planning's Situation Unit, develop a Transportation Plan to support the EOC Action Plan. • Arrange for the acquisition or use of required transportation resources. • Coordinate air transportation needs with Air Operations Branch. • Supervise the Transportation Branch.

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Emergency Operations Centre – Finance/Administration Section

Finance / Admin Section

Emergency Position	Reporting to	Responsibilities
Time Unit Coordinator	**Emergency Operations Centre** *Finance Section Chief*	• Track, record, and report all on-duty time for personnel, including hired and contracted, working during the event or disaster. • Ensure that hired and contracted personnel time records, travel expense claims, and other related forms are prepared and submitted to budget and payroll office. • Supervise the Time Unit.
Compensation and Claims Unit Coordinator	**Emergency Operations Centre** *Finance Section Chief*	• Oversee the investigation of injuries and property / equipment damage claims arising out of the emergency. • Complete all forms required by Worker's Compensation Act. • Maintain a file of injuries and illnesses associated with the event or disaster including results of investigations. • Liaise and consult with the Risk Management Officer on all injury claims. • Supervise the Compensation and Claims Unit.
Procurement Unit Coordinator	**Emergency Operations Centre** *Finance Section Chief*	• Coordinate vendor contracts not previously addressed by existing approved vendor lists. • Coordinate with Supply Unit and Operations Section on all matters involving the purchase, hire, contract, rental, and leases. • Supervise the Procurement Unit.
Accounting Unit Coordinator	**Emergency Operations Centre** *Finance Section Chief*	• Collect and maintain documentation of all disaster information for reimbursement through PEP. • Gather fiscal recovery information from agencies providing emergency response, support and assistance. • Prepare and maintain a cumulative cost report for the event or disaster. • Prepare and coordinate disaster financial assistance documents and claims with PEP and/or PREOC. • Supervise the Cost Accounting Unit and all financial assistance operations.

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6.0 Concept of Communications

During a major emergency or disaster, it is critical that emergency responders are able to quickly communicate with one another, to receive important information, to issue orders to action in the field and to communicate with a variety of other agencies.

It has been the experience in past disasters that operation and usage of communications systems are significantly impacted:

- Radio communications systems will experience large increases in usage resulting in waiting periods to gain access.
- Telephone, cellular and data networks may not function, either because they become overloaded or are rendered inoperable by the disaster.

This leads to a vital need for alternate communications systems and methods to address the demands occurring during a major emergency.

The City has endorsed an Emergency Communications Strategy with recommended actions to increase our communications capacity and increase the reliability of existing systems.

6.1 Methods of Communications

In addition to our day-to-day modes of communications, which includes landlines, cellular phones, email, fax, text messaging and the E-Comm Radio system, the following communication methods have been implemented to increase our capacity during emergencies.

Emergency Telecommunications Data System

Emergency Telecommunications Data System (ETDS) is managed through Industry Canada – Emergency Telecommunications in conjunction with PEP. It is used to designate landlines for emergency response purposes, but has limitations. If telephone systems are cut off due to an emergency, lines would be brought back up in order of priority, or if phone systems needed to be shut down because they are overloaded, emergency designated lines would remain operational. It can also be used in designated areas for security reasons. The ETDS is updated periodically to verify names, addresses and phone numbers and to add or make any changes.

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Inter-Municipal Emergency Radio System (IMERS)

The Inter-Municipal Emergency Radio System is a UHF radio network designed to support or enhance primary means of communications between municipal Emergency Operations Centres in the GVRD. The IMERS is an open or unrestricted net that is used primarily for information sharing and logistical support. In the event of an emergency where too much traffic is clogging the net, a directed net will be imposed and coordinated by PEP. The GVRD maintains the technical aspects of the system and the weekly testing schedule.

Satellite Phones

Mobile satellite phones, normally used to communicate with persons in very remote locations, provide an alternative to terrestrial communications infrastructure, which may become damaged during an emergency. Recognizing this, the City has satellite phone capability in both the primary and backup EOC's and has two mobile satellite phones that can be deployed either to an incident site or to a facility playing a key role in the response to the emergency.

Telephone Lines

The Emergency Operations Centre at City Hall uses Voice over Internet Protocol technology with redundancy. The Emergency Operations Centre at the Works Yard uses Centrex telephone lines to provide dedicated and secure lines that connect directly with TELUS. Using different technology for each facility provides for greater likelihood that the City will have a useable communications infrastructure in the event of a significant emergency or disaster.

City UHF Radio System

The City operates a private UHF mobile radio system, consisting of 4 local repeaters. The primary purpose of this system is to provide voice communications to support the operations of Engineering & Public Works staff, including Public Works Dispatch. An additional repeater has been vehicle installed and handheld portable radios have been acquired to support the usage of this system during a major emergency. Handheld radios are pre-deployed to key emergency facilities including community centres and City Hall.

Amateur Radio

Emergency radio is a public safety lifeline that assists within the community and links the community in crisis to where relief and support can be coordinated. The City's Emergency Program is aligned with the Richmond Amateur Radio club and volunteer amateur radio operators who are available to assist with communications in the event of an emergency. When regular communications are overloaded or rendered unusable because of a disaster,

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amateur radio can fill the gaps and can provide point-to-point communications, as needed, with a high degree of flexibility. Amateurs have the ability to set up communications anywhere and anytime, under almost any conditions. The City has installed amateur radio equipment at six of the large community centres and in the emergency communications vehicle. This allows contact with local and regional EOCs through the volunteer radio operator network. Amateur radio operations train regularly and often take part in emergency exercises so they are prepared for any crisis situation that arises.

Emergency Notification System

The City of Richmond Emergency Notification System, also known as Richmond BC Alert, was launched in May 2015 to complement the existing communication tools used in an emergency situation. The system is capable of sending alerts (by email, telephone, cell phone, SMS text message and fax) when an emergency situation requires immediate action to protect the health, safety or welfare of persons or to limit property damage. Evacuation notices, emergency instructions, direction to emergency reception centres or shelters, and information on family reunification will be among the messages that could be sent out during an emergency situation."

E-Comm Inter-Agency Radio System

Fire, police and ambulance services in Richmond all use the E-Comm Wide-Area Radio System, an advanced digital-capable radio network. This system is designed to allow local emergency responders to communicate with each other and with their counterparts in other communities that also use the E-Comm system, both on a day-to-day basis or in a major emergency or disaster.

7.0 Hazard Specific Guides

The City's Emergency Planning Committee has identified the following key threats for which the City needs to mitigate, plan, and prepare for and potentially respond to:

- Aircraft Incident

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- Chemical, Biological, Radiological, Nuclear and Explosives (CBRNE)
- Critical Infrastructure Failure
- Dangerous Goods Spill Response
- Earthquake
- Flooding
- Medical Emergency (Pandemic)
- Severe Weather

For each of the City's key threats, the following guides provide an overview of the possible effects, the suggested lead agency for the EOC's Operations Section, key departments and agencies that would be involved, activation level and minimum staffing for the EOC and key response measures and priorities.

While the BCEMS response goals and priorities are paramount and apply to every emergency response, additional EOC priorities that are relevant to each hazard have also been identified.

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7.1 Aircraft Incident

Possible Effects	• Damage to property & roads • Disruption of communications • Disruption of traffic • Disruption of utilities • Evacuation • Explosions • Fatalities • Fire • Hazardous materials/toxic fumes & gases • Injuries • International implications • Investigation • Jurisdictional problems • Media attention • Multi-casualty incident • Scene containment & security • Special cargo concerns
Lead Agency	**Within City Boundaries: Richmond Fire Rescue/RCMP** **On Airport Land: YVR/RCMP**
Other Agencies	• Airline(s) • BC Ambulance Service • CBSA (Canadian Border Services Agency) • COR Emergency Programs • COR Environmental Programs • Coroner • Emergency Social Services partner agencies • Federal agencies • Fire • Provincial Emergency Program • RCMP • Transportation Safety Board • Utilities • Vancouver Airport Authority

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	• Vancouver Coastal Health
EOC Activation	• EOC Director • Deputy Director • Liaison Officer • Information Officer • Risk Management Officer • Operations – RCMP, Fire, BCAS, Engineering, Environment, Health and ESS branches • Planning • Logistics • Finance/Administration
EOC Priorities	• Communications with site • Emergency information & media relations • Emergency Social Services • Liaise with external agencies • Mass casualty response support • Traffic control • Evacuation planning • Disaster Response Routes

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7.2 Chemical, Biological, Radiological, Nuclear and Explosives (CBRNE)

Possible Effects	• Civil unrest • Collapse of buildings, structures & infrastructure • Community fear • Contamination • Damage to property, roads & bridges • Disruption of communications • Disruption of traffic • Disruption of utilities • Economic impact • Evacuation • Explosions • Fatalities • Fires • Hoax incident (immediate aftermath) • Injuries • International implications • Jurisdictional problems • Limited resources • Media attention • Public health concerns • Trapped people
Initial Lead Agency	**Richmond Fire Rescue** **RCMP**
Other Agencies	• BC Ambulance Service • CBRN Specialists • COR Emergency Programs • COR Engineering & Public Works • COR Environmental Programs • Coroner • Emergency Social Services partner agencies • Federal agencies • Fire • Ministry of Environment

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	• Other provincial ministries • Provincial Emergency Program • Public Safety Canada • Targeted industry &/or agency • Transportation agencies • Utilities • Vancouver Coastal Health
EOC Activation	• EOC Director • Deputy Director • Liaison Officer • Information Officer • Risk Management Officer • Operations – All branches • Planning – All branches • Logistics • Finance/Administration
EOC Priorities	• Communications with sites • Decontamination support • Emergency information & media relations • Emergency Social Services • Evacuation planning • Liaise with external agencies • Mass casualty response support • Public notification • Resource acquisition & deployment • Situation & damage assessment

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7.3 Critical Infrastructure Failure

Potential Effects	• Contamination of potable water • Damage to property • Disruption of business & industrial activities • Disruption of some utilities • Disruption of traffic • Environmental impact • Evacuation • Explosion • Fatalities • Fire • Injuries • Media attention • Potential loss of utilities, sewerage, and facilities • Public Health concerns for people & animals
Initial Lead Agency	**Richmond Fire Rescue** **Engineering & Public Works**
Other Agencies	• BC Ambulance Service • COR Emergency Programs • COR Engineering & Public Works • COR Environmental Programs • Emergency Social Services partner agencies • Environment Canada • GVRD • Ministry of Environment • Ministry of Transportation • Provincial Emergency Program • RCMP • Transport Canada • Utilities • Vancouver Coastal Health
EOC Activation	• EOC Director • Deputy Director • Liaison Officer • Information Officer

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	• Risk Management Officer • Operations – All branches • Planning • Logistics • Finance/Administration
EOC Priorities	• Communication with sites • Disaster Response Routes • Emergency information & media relations • Emergency Social Services • Evacuation planning • Public notification • Restoration of critical infrastructure • Situation & damage assessment • Traffic control

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7.4 Dangerous Goods Spills

Possible Effects	• Disruption of traffic • Disruption of utilities • Disruption to businesses • Environmental damage • Evacuation or Shelter In Place • Explosion • Homelessness • Infrastructure damage • Injuries & fatalities • Media attention • Property damage • Public health concerns
Initial Lead Agency	**Richmond Fire Rescue**
Other Agencies	• COR Emergency Programs • COR Emergency Social Services • COR Engineering & Public Works • COR Environmental Programs • Coroner • Emergency Social Services partner agencies • Federal agencies (TEAP, Canutec, CHLOREP) • Industry • Ministry of Environment • Provincial Emergency Program • RCMP • Transportation agencies • Transport Canada • Utilities • Vancouver Coastal Health
EOC Activation	• EOC Director • Deputy Director • Liaison Officer • Information Officer • Risk Management Officer

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	• Operations – All branches • Planning • Logistics • Finance & Administration
EOC Priorities	• Cost recovery • Emergency information & media relations • Emergency Social Services • Evacuation planning • Liaise with external agencies • Public notification • Resource acquisition & deployment • Traffic control

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7.5 Earthquake

Possible Effects	• Care of pets and livestock • Collapse of buildings, structures • Disaster debris • Disruption of communications • Disruption of health services • Disruption of traffic • Disruption of utilities • Evacuation • Explosions • Fire • Flooding • Homeless • Infrastructure damage • Injuries & fatalities • Jurisdictional issues • Lack of essential services (water, sewerage) • Limited resources • Media attention • Multiple incident sites • Property damage • Public health concerns • Trapped victims
Initial Lead Agency	**Richmond Fire Rescue** **Engineering & Public Works**
Other Agencies	• BC Ambulance Service • COR Emergency Programs • COR Engineering & Public Works • COR Environmental Programs • Coroner • Emergency Social Services partner agencies • Ministry of Transportation • Provincial Emergency Program • Provincial ministries • Public Safety Canada

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	• Richmond Fire Rescue • RCMP • Utilities • Vancouver Coastal Health
EOC Activation	• EOC Director • Deputy Director • Liaison Officer • Information Officer • Risk Management Officer • Operations – All branches • Planning – All branches • Logistics – All branches • Finance & Administration
EOC Priorities	• Business continuity planning • Disaster debris management • Disaster Response Routes • Emergency information & media relations • Emergency Social Services • Enact Mutual Aid • Evacuation planning • Public health • Corporate & community recovery planning • Resource acquisition & deployment • Restoration of critical facilities & infrastructure • Secure potable water & water for firefighting • Traffic control

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7.6 Flooding

Possible Effects	• Care of pets and livestock • Disaster debris • Disruption of communications • Disruption of traffic • Disruption of utilities • Evacuation • Fatalities • Homeless • Infrastructure damage • Injuries • Lack of essential services • Media attention • Property damage • Trapped victims
Initial Lead Agency	**Engineering & Public Works**
Other Agencies	• COR Emergency Programs • COR Environmental Programs • COR Emergency Social Services • Coroner • Emergency Social Services partner agencies • Ministry of Environment • Ministry of Transportation • Provincial Emergency Program • RCMP • Richmond Fire Rescue • Vancouver Coastal Health
EOC Activation	• EOC Director • Deputy Director • Liaison Officer • Information Officer • Risk Management Officer • Operations – All branches • Planning – All branches

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	• Logistics • Finance & Administration
EOC Priorities	• Disaster Response Routes • Emergency information & media relations • Emergency Social Services • Evacuation planning • Flood containment & mitigation support • Liaise with external agencies • Public notification • Restoration of critical facilities & infrastructure • Situation & damage assessment • Traffic control

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7.7 Medical Emergency – Epidemic/Pandemic

Potential Effects	• Civil unrest • Closure of businesses • Closure of schools • Disposal of the dead • Disruption of health care services • Disruption of transportation services • Extreme emotions • Fatalities • International implications • Limited health care resources • Mass numbers of people sick • Media attention • Overwhelmed health care facilities • Perimeter controls of affected areas • Possible vaccine shortages • Potential evacuation • Public health concerns • Quarantine • Separation of family members • Shelter-in-place
Lead Agency	**Vancouver Coastal Health**
Other Agencies	• BC Ambulance Service • COR Emergency Programs • COR Engineering & Public Works • Coroner • Environmental Services • Health Canada • Health care facilities • Ministry of Health • Provincial Emergency Program (PREOC) • Public Safety Canada • RCMP • Richmond Fire Rescue • School District

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EOC Activation	• EOC Director • Deputy Director • Liaison Officer • Information Officer • Risk Management Officer • Operations – Health, Fire, BCAS, RCMP, Environment and ESS Branches • Planning • Logistics • Finance/Administration
EOC Priorities	• Alternate care facilities • Emergency information & media relations • Emergency Social Services • Employee support program • Essential services • Infection control • Notification & surveillance • Resource acquisition & deployment • Support Vancouver Coastal Health

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7.8 Severe Weather

Potential Effects	• Collapse of buildings & structures (due to weight of snow & ice) • Damage to property & roads • Diminished personal resources (people unable to get out and get groceries) • Disruption of traffic • Disruption of utilities (eg. power outages) • Fatalities • Injuries • Limited resources for snow removal • Media attention • People confined to their homes
Lead Agency	**Engineering & Public Works**
Other Agencies	• BC Ambulance Service • COR Emergency Programs • Coroner • Emergency Social Services partner agencies • Environment Canada • Provincial Emergency Program • Richmond Fire Rescue • RCMP • Transportation agencies • Vancouver Coastal Health
EOC Activation	• EOC Director • Deputy Director • Liaison Officer • Information Officer • Risk Management Officer • Operations – All branches • Planning • Logistics • Finance/Administration
EOC Priorities	• Communications with site(s) • Disaster debris management

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	• Disaster response routes • Emergency information & media relations • Emergency Social Services • Environmental monitoring & advance planning • Evacuation planning • Resource acquisition & deployment • Restoration of utilities and critical infrastructure • Situation & damage assessment • Traffic control

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8.0 Division Roles & Responsibilities

The following section outlines the general roles and responsibilities of City divisions. It is expected that divisions and departments will staff or support the EOC in its response to the emergency or disaster as directed by the EOC Director. The development and maintenance of departmental emergency plans are the responsibility of each department with the guidance and assistance of the Emergency Management Office.

Division With Responsibility for the Following Areas	Responsibilities
Arts/ Culture and Heritage Services	• Support the EOC and emergency response, as directed by the EOC Director.
Building Approvals	• Lead department responsible for building damage assessment. As a first priority, buildings listed as critical facilities will be assessed. • Assist in the coordination of building damage assessment for schools and churches as alternate ESS facilities. • Assist in the coordination of building damage assessment for private buildings, with hotels being the first priority in this grouping. • This should include provisions for agreements with private firms to support the City in this function to ensure rapid recovery of business. • This department is also responsible for establishing an expedited permitting process for rebuilding to ensure businesses can undertake necessary repairs in a rapid manner. This should also include provisions for agreements with private firms to support the City in this function.
Business Liaison	• Work with the Building Approvals Division to coordinate building damage assessment for local businesses. • Work with the Building Approvals Division to facilitate an expedited process for permits to rebuild and repair businesses. • Staff and/or support the Recovery section of the EOC.
Business Licences	• Support the EOC and emergency response, as directed by the EOC Director.
City Clerks Office	• Act as policy liaison for Council to advise of requirements for Declaring a Local State of Emergency and establishing other policies, as required.
Community Bylaws	• Support Richmond RCMP, the EOC and emergency response, as directed by the EOC Director.
Community Social Services	• Provide support to the Emergency Social Services Branch and assist in the development of the recovery plan.

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Division With Responsibility for the Following Areas	Responsibilities
Corporate Communications	• Manage the internal communications, media relations and public information from the Emergency Operations Centre. • Maintain the Emergency Information Plan. • Activate and direct the emergency information team as they coordinate the Emergency Call Centre, Media Centre, assist with news conferences and site media activities.
Corporate Programs Management Group	• Support the EOC and emergency response, as directed by the EOC Director.
Customer Service	• Establish the City's Emergency Call Centre in the City Hall Computer Training Room T. 6.132 unless otherwise directed by the EOC Director. • Work with the Senior Information Officer in the EOC to ensure call centre staff have current information concerning information to be released to the public. • Provide a daily summary report of the types of calls and issues raised by the public to the Emergency Operations Centre. • Coordinate the set up of news conferences at City Hall, Council Chambers, etc. • Refer matters, as required, to the Emergency Operations Centre for resolution.
Development Applications	• Will be re-assigned to the Building Approvals Division to assist with processing permits to rebuild and repair buildings.
Economic Development	• Liaise with and support the business community as much as possible. • Staff the Planning – Business Continuity function and implement continuity and/or recovery plans, as directed by the EOC Director.
Emergency Programs	• Emergency Programs plays a key role in facilitating the operations of the City's Emergency Operations Centre and Emergency Social Services.
Environmental Programs	• Responsible for the planning, management and overall coordination of disaster debris, including collection and disposal. This includes establishment of temporary disposal facilities and measures to reduce the impact of waste on landfill capacity, i.e. recycling measures and public communications in this regard, etc. • Responsible for maintaining the Dangerous Goods Spill Response Plan, and providing advice and assistance to the Fire Department on environmental impacts relating to spills of dangerous goods or special waste. • Liaise with Vancouver Coastal Health on issues that may impact public health.

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Division With Responsibility for the Following Areas	Responsibilities
Engineering Planning	• Support the Building Approvals Department in the permitting process for rebuilding. • Support the development of the Recovery Plan in the Planning Section of the EOC. • Staff and support the Planning Section of the EOC with GIS needs.
Engineering Design & Construction	• Provide emergency design services to support the rapid repair of critical City infrastructure. This should include provisions for agreements with private firms to support the City in this function. • Support the development of the Recovery Plan in the Planning Section of the EOC.
Facility Operations & Maintenance	• Provide maintenance services for designated reception centres and established shelters. • Provides security, temporary sanitation and other related services to activated reception centres.
Film Office	• Support the EOC and emergency response, as directed by the EOC Director.
Finance	• Provides staff to support to the Finance/Administration Section including staffing of the following positions: Finance Section Chief, coordinators for Time, Purchasing, Compensation and Claims, and Cost. • Coordinates the submission of Disaster Financial Assistance claims to the Provincial Emergency Program. • Establish appropriate account numbers to efficiently facilitate cost recovery and tracking.
Fire Rescue	Richmond Fire Rescue is a key response agency in the event of an emergency or disaster. Primary responsibilities will include the following: • Damage assessment of Fire Halls. • Rapid community damage assessment, i.e. windshield survey of established routes. • Fire suppression. • Search and rescue. • Spill response & CBRNE management.
Fleet Operations	• Arrange for deployment of City equipment as directed by the Logistics Section Chief. • Establish a program to ensure rapid repair of equipment, including use of privately operated repair shops. • Arrange for acquisition of equipment as directed by the Logistics Section Chief.

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Division With Responsibility for the Following Areas	Responsibilities
Human Resources	• Work with the Emergency Operations Centre Director to establish work schedules and undertake to inform City employees of their work hours and reporting location(s). • Coordinate emergency counselling & critical incident stress debriefing for City employees as required. • Undertake to arrange for financial advice to City employees impacted by the disaster. • Undertake to acquire temporary labour and assistance as directed by the Emergency Operations Centre Director. • Work with the union to establish and implement an emergency staff policy. • Establish a staff call centre to support staff and their families.
Information Technology	• Staff and support the EOC Logistics Section by ensuring the technical needs, including telephone and computer equipment, at the Emergency Operations Centre, Emergency Call Centre and critical facilities are met. • Ensure, on an on-going basis, the off-site back up of key City business data.
Intergovernmental Relations and Protocol Unit	• Support the EOC and emergency response, as directed by the EOC Director.
Law	• Staff the EOC Risk Management function. • Identify and act on potential legal liabilities and risk management issues.
Project Development	• Project Development staff may be re-assigned to the Building Approvals Department to assist with building damage assessment activities. • Support the development of the Recovery Plan in the Planning Section of the EOC. • Support the EOC and emergency response, as directed by the EOC Director.
Parks	• Parks Operations staff will be re-assigned to key response areas within Public Works operations as required. • Support the EOC and emergency response, as directed by the EOC Director.
Policy Planning	• Staff and support the Planning Section at the EOC.
Public Works Administration	• Responsible for setting up the Works Yard Emergency Operations Centre in the event of its activation. • Provide support services as required, including scribe duties, clerical support, general errands and related tasks. • Provide communications support to the Emergency Operations Centre. • Support the EOC and emergency response, as directed by the EOC Director.

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Division With Responsibility for the Following Areas	Responsibilities
RCMP	Richmond RCMP is a key response agency in the event of an emergency or disaster. Primary responsibilities will include the following: • Crowd control • Civil order • Disaster area security • Establish and maintain disaster response routes as designated by the EOC Director, to the best of their ability. • Traffic control • Evacuation planning, implementation and control of evacuation • Acts for the coroner in all incidents where deaths are involved, until such time as that responsibility is assumed by the coroner.
Recreation	• Staff and support Emergency Social Services. This includes assisting in the operation of established reception centres, acting as site information officers, supporting the ESS Branch Coordinator at the EOC.
Real Estate	• Undertake property acquisition as directed by the Emergency Operations Centre Director. • Advise the Emergency Operations Centre Director concerning suitable City property for emergency use and makes necessary arrangements for that purpose.
Roads & Construction	• Undertake damage assessment of the City's dykes and roads. • Establish priorities for dyke repair and road restoration in consultation with the General Manager – Engineering & Public Works. • Undertake immediate action, as a first priority, to repair damage to the City's dykes and, where necessary, to privately owned dyke infrastructure. • Establish continuous monitoring of the City's and privately owned dykes. • Clear debris from City roads, with the first priority to designated disaster response routes • Establish priority for road repair in consultation as directed by the EOC Director. • Commence operational activities to repair road surfaces. • Development and maintenance of a departmental/divisional emergency plan.

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Division With Responsibility for the Following Areas	Responsibilities
Sewerage & Drainage	• Undertake damage assessment of the City's sewer and drainage systems. • Establish priority(ies) for sewer service restoration in consultation with the General Manager – Engineering & Public Works. • Commence operational activities to restore sewer service. • Work with the Emergency Social Services Coordinator regarding the emergency provision of sanitary facilities. • Liaise with Vancouver Coastal Health on issues that may impact public health.
Transportation	• Responsible for establishing a staging area for transportation equipment. • Arrange for transportation equipment as directed by the Logistics Section Chief. • Assist the logistics section by arranging for transportation of people, animals, pets and livestock as required.
Water Services	• Undertake damage assessment of City water services. • Establish priorities for water service restoration in consultation with the General Manager – Engineering & Public Works. • Commence operational activities to restore water service. • Work with the Emergency Social Services Coordinator regarding the emergency provision of potable water. • Work with the Fire Chief regarding the emergency provision of water for fire fighting purposes. • Liaise with Vancouver Coastal Health on issues that may impact public health.

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9.0 External Agencies

Contact information for external agencies is provided in Annex 4: Emergency Communications Directory.

9.1 Federal Agencies

9.1.1 Public Safety Canada (PSC)

Public Safety Canada (PSC) is responsible for implementing a comprehensive approach to protect Canada's critical infrastructure and enhance Canada's emergency management framework.

Responsibilities:

- Coordinate federal planning with the province through a regional office. This ensures compatibility of procedures and cooperative plans.
- Promote, support, and assist in coordinating critical infrastructure protection in ten key areas: energy and utilities, communications and information technology, finance, health care, food, water, transportation, safety, government and manufacturing.
- Enhance emergency management fundamentals: mitigation, preparedness, response and recovery.
- Promote dialogue among Canada's critical infrastructure owners and operators and foster information sharing on threats and vulnerabilities.
- Monitor and coordinate a national program of cyber and physical incident response and recovery.
- Work with governments and other organizations to develop a greater national capacity for economic and social resiliency against disasters.
- Support research and development in the field of emergency management.
- Deliver public and stakeholder emergency management awareness programs.

PSC administers the Joint Emergency Preparedness Program which provides funding and support to emergency preparedness and critical infrastructure protection projects and initiatives. Projects are jointly financed by federal, provincial and territorial governments, with the aim to reduce injuries and loss of human life, property damage, and to assure the continuation of our critical services in an emergency.

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Requests for federal assistance during an emergency or disaster are communicated through the Provincial Emergency Program.

9.1.2 Industry Canada

Industry Canada is the lead Federal department for emergency telecommunications policies and programs in Canada. Emergency Telecommunications Data System is administered by the Emergency Telecommunications Branch. Activation of the Emergency Telecommunications Data System operated by Industry Canada is through the Provincial Emergency Program.

Responsibilities:

Industry Canada has the lead role for emergency telecommunications in Canada. Industry Canada's roles and responsibilities include:

- Develop and maintain emergency plans and undertake exercises for telecommunications at the national, regional and district levels.
- Give advice and assistance in mitigation and in response to the disruptive effects of emergencies on telecommunications and coordinate the provision of a public alert service.
- Facilitate the provision of appropriate telecommunications equipment or services required in emergency response operations.
- Coordinate and manage programs to ensure the availability of telecommunications to meet federal requirements during periods of system overload or degradation.
- Coordinate the provision of an emergency broadcast service, based on the facilities and services of the Canadian Broadcasting Corporation, Environment Canada and, as required, privately owned networks and stations (lead role).
- Facilitate the provision of appropriate telecommunications equipment or services required in emergency response operations, as requested by lead federal departments; e.g. in close collaboration with the telecommunication industry, updates a national and regional inventory of telecommunication equipment which could be used in time of emergency.
- Provide advice and assistance, as appropriate, to private or public telecommunications undertakings in mitigating the disruptive effects of emergencies on domestic and external telecommunications (lead role).
- Provide guidance, advice and coordination assistance to Canada's national and international telecommunications networks and broadcasting systems, with respect to

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the communications requirements of emergency responders, the rapid reception and transmission of essential public information (lead role).

- Coordinate and manage programs to ensure the availability of telecommunications to meet federal requirements during periods of system overload or degradation (lead role).

9.1.3 12 Service Battalion

The 12 Service Battalion, located here in Richmond, is a Combat Service Support Unit that provides transportation, supply and maintenance support to all Field Units under combat conditions. As a member of the City of Richmond's Emergency Planning Committee, the 12 Service Battalion plays a role in guiding the development of the City's emergency plans and programs.

While the City works with the 12 Service Battalion on local planning initiatives, to activate this resource or any other federal resource during an emergency, the request must be sent through the Provincial Emergency Program.

9.1.4 Canadian Coast Guard

Rescue Coordination Centre 1-800-567-5111

The Canadian Coast Guard provides Canada's civilian fleet, programs, services and marine expertise to maintain maritime safety for all who use Canada's waters. In partnership with other federal agencies, provincial governments and volunteer organizations, the Coast Guard preserves safety at sea through a focused program of prevention and response.

Coast Guard's program objective of safe and accessible waterways is well supported by each of its five fundamental mandated roles:

1. Maritime safety
2. Protection of the marine and freshwater environment
3. Facilitation of maritime trade and commerce and maritime accessibility
4. Support to marine science
5. Support to Canada's federal maritime priorities

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9.2 Provincial Agencies

9.2.1 Provincial Emergency Program

The Provincial Emergency Program, Ministry of Public Safety and Solicitor General, maintains effective awareness, preparedness, response, and recovery programs to reduce the human and financial costs of disasters in BC. The Provincial Emergency Program's mission is to enhance public safety and reduce property and economic loss from actual or imminent emergencies or disasters by:

- Mitigating the effects of emergencies and disasters through education and awareness.
- Promoting preparedness through planning, training and exercising.
- Coordinating and assisting in response activities.
- Developing and implementing recovery measures.

The Provincial Emergency Program coordinates the following areas of responsibility:

- Maintains a 24-hour Emergency Coordination Centre (1-800-663-3456) to provide local authorities and agencies with assistance and guidance.
- Issues PEP Task Numbers to local authorities in order that they may account for all expenses incurred during response and recovery efforts, and apply for reimbursement of those expenses authorized by the Provincial Emergency Program.
- Arranges for Workers' Compensation coverage for registered emergency workers and volunteers.
- Supports the efforts of emergency volunteers who provide critical services in the areas of emergency preparedness, response, and recovery, such as: Provincial Emergency Radio Communications, Search and Rescue, and Emergency Social Services Volunteers.
- Activates the Provincial Regional Emergency Coordination Centre (PREOC) to support the response at the local and regional level.

9.2.2 Coroners Service of British Columbia

Under the Ministry of Public Safety and the Solicitor General, the Coroners Service of British Columbia is responsible for the inquiry/investigation of all unnatural, unexpected, unexplained or unattended deaths. In the Lower Mainland, the service is managed by the Vancouver Metro Regional Office under the direction of the Chief Coroner and is activated by the RCMP.

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The Coroners Service of British Columbia is committed to conducting a thorough and independent examination of the factors contributing to death in order to improve community safety and quality of life in the Province of British Columbia.

9.2.3 BC Ambulance Service

BCAS provides public ambulance service in BC under the authority of the Emergency Health Services Commission of the provincial Ministry of Health. The commission is mandated to oversee the broad responsibility of overall emergency medical service provision, regulation and direction in BC, including emergency pre-hospital treatment and transportation of patients.

In Richmond, the local BC Ambulance Service is a member of the City's Emergency Planning Committee and several working groups, such as CBRNE, Site Communications, Exercise Design and Multi-agency Site Response.

9.3 Local Agencies

9.3.1 Vancouver Coastal Health Authority

The Medical Health Officer is responsible for the coordinated response for all medical and health services and facilities within the City. As a member of both the City's Emergency Planning Committee and EOC Management Group, the Medical Health Officer guides the City's planning and preparedness initiatives and also has the authority to activate the City's Emergency Operations Centre. The Medical Health Officer may potentially fill the role of Operations Section Chief as well as the Operations Health Branch Coordinator in the Emergency Operations Centre.

9.3.2 School District No. 38: Richmond

The Richmond School District is responsible for developing plans and procedures to protect the staff and students at approximately 38 Elementary Schools, with an approximate enrolment of over 12,000 students and 11 Secondary Schools, with an approximate enrolment of over 10,000 students.

As a member of the City's Emergency Planning Committee, the School District is an important resource in assisting the City in planning for our vulnerable communities.

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9.4 ESS Partner Agencies

At the Provincial Emergency Program, the Emergency Social Services (ESS) Office:

- Provides overall coordination of ESS across BC.
- Develops policies and procedures for use by ESS teams.
- Supports communities in building capacity and planning for and operating ESS.
- Funds training for volunteers and provides volunteer support.
- Liaises with local governments and provincial ministries, federal government departments and non-government organizations.
- Supports local and regional level ESS responses to disasters and emergencies.
- Manages provincial level ESS responses.
- Activates ESS support organizations during a disaster.

The ESS Office has agreements with ESS Support Organizations to provide additional resources to communities in major emergencies. In addition to the key organizations listed below, the following organizations provide ESS support:

- BC Housing
- Buddhist Compassion Relief Tzu Chi Foundation Canada
- Canadian Disaster Child Care Society
- Justice Institute of British Columbia
- Canadian Disaster Animal Response Team
- Emergency Social Services Association

9.4.1 Canadian Red Cross

The Canadian Red Cross trains community volunteers in Family Reunification functions. When requested by the ESS Office during a response, Red Cross may provide family reunification volunteers with disaster experience to assist local volunteers. The Central Registration and Inquiry Bureau (CRIB) can be used if there are multiple registration sites, and to respond to large numbers of inquiries from friends and families looking for loved ones from outside the disaster area.

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9.4.2 St. John Ambulance

St. John Ambulance maintains a provincial database of people who have taken its First Aid courses and who are willing to help in the event of an emergency. St. John Ambulance sends personnel to set up and staff first aid stations at Reception Centres.

9.4.3 Salvation Army

The Salvation Army is responsible for training local ESS volunteers in the function of Meet & Greet and Emotional Support.

On request from the ESS Office, The Salvation Army can provide additional Meet & Greet or Emotional Support workers, if needed, from outside the area.

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10.0 Plan Maintenance

Updates

Every three years, the General Manager, Law and Community Safety shall undertake a comprehensive review of the plan including, as a minimum, changes to the concept of operations to reflect lessons learned from exercises, response to actual emergencies or any other changes.

Additions and Modifications

In addition, the General Manager, Law and Community Safety shall:

- Establish supporting documents or annexes, such as notification procedures or an operations manual, as necessary.
- Review the plan following any activation or exercise to incorporate recommendations and findings.
- Review information on facilities and resources annually to ensure the information is current.

With the assistance of the Emergency Management Office, General Managers are responsible for ensuring that departmental emergency plans are developed and reviewed on an annual basis.

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11.0 Training & Exercises

To support the staff roles during an emergency as identified in this plan, the Emergency Management Office will coordinate an annual training and exercise schedule. The City takes an inclusive approach to training to allow emergency response agencies and staff of various disciplines to interact, test new skills and roles together before disaster strikes.

Exercises include drills to test a focused procedure or technology; tabletop exercises to familiarize staff with their roles, test operational procedures and validate plans; functional exercises to test facilities, equipment and roles and responsibilities; and full-scale exercises to provide the most realistic scenario possible.

The following training matrix outlines the required and optional courses by emergency position.

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Training Matrix

H Required *I Optional*

Course	COR Senior Management	EOC Management Staff	Emergency Management Staff	Operations Section Staff	Planning Section Staff	Logistics Section Staff	Finance & Admin Section Staff	EOC Support Staff
Emergency Operations Centre Executive Training This course provides participants with key information to effectively respond in the EOC.	H							
COR Emergency Management Orientation To address the Emergency Management System in BC and specific City of Richmond emergency management initiatives including the Emergency Management Plan and staff roles, Emergency Operations Centre, Emergency Social Services, etc.		H	H	H	H	H	H	H
Introduction to Emergency Management To introduce the basic concepts of emergency management including: BCEMS, Provincial Emergency Program & Emergency Social Services		H	H	H	H	H	H	H
Emergency Operations Centre (EOC) Level 1 - Introduction To introduce EOC functions, operations, information flow, applying BCEMS to the EOC environment		H	H	H	H	H	H	H
Emergency Operations Centre Level 2 To enable participants to perform their roles and responsibilities in the EOC		H	H	H	H	H	H	I
Emergency Operations Centre Level 3 – Operations This course is designed to familiarize participants with the roles and responsibilities of the EOC Operations function.		H	H	H	I	I	I	I
Emergency Operations Centre Level 3 – Planning This course is designed to familiarize participants with the planning roles and responsibilities, coordinate planning activities internally and externally of the EOC.		H	H	H	H	I	I	I
Emergency Operations Centre Level 3 – Logistics This course is designed to promote effective logistics resources and support management, which is crucial during an emergency in order to support site operations.		H	H	I	I	H	I	I
Emergency Operations Centre Level 3 – Finance and Administration This course is designed to provide an overview of finance/admin function, including allowable expenses under the Provincial Disaster Financial Assistance and Community Disaster Recovery Programs.		H	H	I	I	I	H	I

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Glossary & References

BCEMS – British Columbia Emergency Response Management System	The British Columbia Response Management System is a comprehensive management structure scheme that ensures a coordinated and organized provincial response and recovery to any and all emergency incidents. The broad spectrum of components of BCEMS includes operations and control management, qualifications, technology, training and publications.
CF – Canadian Forces	The mission of the Canadian Forces is to defend Canada, its interests and its values, while contributing to international peace and security. In a disaster, where the magnitude overwhelms both the municipal and provincial capacity to manage the situation, PEP is the direct link to requesting CF emergency assistance.
DFA – Disaster Financial Assistance	A financial assistance program to help disaster victims restore or replace essential items that are not insurable.
DND – Department of National Defence	The mission of the Department of National Defence is to defend Canada, its interests and its values, while contributing to international peace and security. PEP is the direct link to requesting DND emergency assistance for the province.
DOC – Department Operations Centre	An operations centre established and operated by a department of a jurisdiction or agency to coordinate their emergency response efforts. Structure and function is similar to EOC.
ECC – Emergency Coordination Centre	The Emergency Coordination Centre at the Provincial Emergency Program headquarters receives and disseminates information from multiple sources regarding emergency situations. The 24-hour Emergency Coordination Centre also serves as the "incident message centre" for the Provincial Emergency Coordination Centre.
EOC – Emergency Operations Centre	A pre-designated facility established by a local authority, jurisdiction or agency to coordinate the site response and support in an emergency.
ESS – Emergency Social Services	Emergency Social Services are those services that are provided short term (generally 72 hours) to preserve the emotional and physical well-being of evacuees and response workers in emergency situations.

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ESSD – Emergency Social Services Director	An Emergency Social Services Director is a person appointed by the local authority, responsible for the management and coordination of the local ESS Program. In Richmond, the Emergency Social Services Volunteer Management Coordinator fulfills the role of the Emergency Social Services Director.
GVRD – Greater Vancouver Regional District	The Greater Vancouver Regional District (GVRD) is a partnership of 21 municipalities and one electoral area that make up the metropolitan area of Greater Vancouver. The GVRD's role is to deliver essential utility services like drinking water, sewage treatment, recycling and garbage disposal and protect and enhance the quality of life in our region by managing and planning growth and development, as well as protecting air quality and green spaces.
HRVA – Hazard, Risk and Vulnerability Analysis	The hazard, risk and vulnerability analysis is one part of the tool kit prepared by PEP for communities to use in their emergency planning to identify the hazards and their risk posed to the community.
ICS – Incident Command System	A standardized at-scene emergency management concept specifically designed to allow its user(s) to adopt an integrated organizational structure equal to the complexity and demands of single or multiple incidents, without being hindered by jurisdictional boundaries. BC's emergency management structure is based on this system.
JEPP – Joint Emergency Preparedness Program	A federal cost-sharing program with the province and local authorities that encourages the provinces and territories to undertake emergency preparedness projects that support national priorities.
MOC – Ministry Operations Centre	An Operations Centre established and operated by a ministry to coordinate their emergency response efforts. Structure and function is similar to PREOC.
MST – Mobile Support Team	Mobile Support Teams are a provincial regional ESS resource, which, if requested by a local authority, can be deployed to provide on-site training, consultation and support to any community not able to mobilize a sufficient number of trained ESS volunteers during an evacuation.
PEP – Provincial Emergency Program	The Provincial Emergency Program is part of the Ministry of Public Safety and Solicitor General and is mandated to coordinate the province's integrated emergency responses and assistance to

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	communities in an emergency.
PECC – Provincial Emergency Coordination Centre	An Emergency Operation Centre established and operated at the provincial central coordination level to direct and coordinate the provincial government's overall emergency or disaster response and recovery efforts. Located at the Provincial Emergency Program (PEP) headquarters in Victoria.
PIO – Public Information Officer	Public Information Officer is a title used for a person, typically in government, who compiles and disseminates public information, usually through the media. Within an EOC structure, this person is usually referred to as the Information Officer.
PREOC – Provincial Regional Emergency Operations Centre	An Emergency Operations Centre established and operated at the regional level by provincial agencies to coordinate provincial emergency response efforts.
PSC – Public Safety Canada	Public Safety Canada is a Federal department that ensures coordination across all federal departments and agencies responsible for national security and the safety of Canadians.

References

The City would also like to acknowledge the following resources that were used in developing this plan:

Provincial Emergency Program, Ministry of Public Safety and Solicitor General, Emergency Management Division, Justice Institute of British Columbia: *Emergency Operations Centre Operational Guidelines*, 2002.

Provincial Emergency Program, Ministry of Public Safety and Solicitor General: *Local Authority Guidelines to Declaration of a State of Emergency,* 2003.

Provincial Emergency Program, Ministry of Public Safety and Solicitor General: *Financial Assistance for Emergency Response and Recovery Costs: A Guide for BC Local Authorities and First Nations,* 2005.

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12.0 Distribution

12.1 Distribution List

Copy No.	
1-9	Mayor & Council
10	Chief Administrative Officer
11	Deputy Chief Administrative Officer
12	General Manager, Business & Financial Services.
13	General Manager, Community Services
14	General Manager, Engineering & Public Works
15	General Manager, Law & Community Safety
16	General Manager, Parks & Recreation
17	General Manager, Planning & Development
18	General Manager, Project Development & Facilities Services
19	Director, City Clerk's Office
20	Director, Engineering
21	Director, Finance
22	Director, IT
23	Director, Public Works
24	Director, Transportation
25	City Solicitor
26	Staff Solicitor
27	Staff Solicitor
28	Senior Manager, Corporate Communications
29	Senior Manager, Media Relations
30	Manager, Emergency Programs
31	Manager, Environmental Sustainability
32	Manager, Occupational Health & Safety
33	Chief Licence Inspector & Risk Manager
34	Communications Officer
35	Coordinator, Emergency Management
36	Coordinator, Emergency Social Services/Volunteer Management
37	Medical Health Officer
38	Paramedic Chief i/c Richmond North, BCAS
39	Chief, Richmond Fire Rescue
40	Officer in Charge, RCMP
41-43	City Hall EOC
44-46	Works Yard EOC

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Issue	Mitigation	Engagement Impact	Owner
Privacy Concern	No Personal Data	Clear communication in future engagement	Claudia Jesson
Security Concern (hacking)	Robust security measures using best practice	Clear communication in future engagement	Vincent Chu
Language barriers	Use of Google Translate on iPads to review project information and survey questions. Ensure multilingual (in particular Cantonese-speaking) volunteers at community events/ open houses to mitigate Google Translates shortfalls when it comes to Cantonese translation.	Google Translate provides translation into multiple languages – it is unlikely we would have volunteers who can speak every required language at any one event.	Lisa Fedoruk
Traffic disruption during installation of technology	Minimize road closures Installation during off-peak hours	Clear communication in future engagement	Bill Johal
Technology and digital platforms are too complicated	User friendly design Education and training	Walk-through of technology and digital platforms Technology literacy workshops Clear communication in future engagement	Vincent Chu
Technology will become obsolete in future	Best practice standards that can be updated as technology progresses "Plug and play" components that can be removed or updated without affecting other components in the system. Non-specific product trademarks or brands.	Clear communication in future engagement	Vincent Chu

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ALIGNING STRATEGIC INITIATIVES

A number of our Advisors have ongoing parallel initiatives or projects that are related to and support the outcomes of our Smart Cities projects and any of these projects could integrate into the Intelligent Operations Hub. Projects are being coordinated with the Project Office and will amplify the impact of our projects. We are developing data sharing agreements, Data Commons for government partners and processes that will govern the exchange, use and security of data between advisors.

EMERGENCY MANAGEMENT BC

Early Warning System Notification. Sensors on the east coast of Vancouver Island monitor seismic activities by the Oceans Network Canada and the University of Victoria (UVic). A transmission is already delivered to Richmond to support the Canada Line. This notification will be shared with the Operations Centre and add up to 90 seconds of warning.

Prioritized-Post Earthquake Response (PPR): This system provides real-time information on the performance of critical facilities in an earthquake and helps responding agencies with decision making in during emergency response. The system will support pre-earthquake response to and within buildings and infrastructure. The project includes the installation of 10 sensors across the City on municipal and provincial assets. The information will be shared between Richmond and the Province as well as other interested stakeholders.

INNOVATION SUPERCLUSTERS INITIATIVE PROJECT SUBMISSION (JULY 2019):

This project, led by MDA will integrate City data (including water pressure sensors, pump stations and drainage and sewer sensors) Provincial data, BC Hydro, and Fortis BC and other key stakeholder information into an analytic predictive model which will be used to identify and mitigate risk to achieve the following outcomes:

- Early detection and mitigation of flooding;
- Early detection and mitigation of liquefaction and earthquakes;
- Early detection and mitigation of spill response to protect the riparian zone; and
- Decrease in traffic collisions due to inclement weather with variable speeds on roadways.

New and existing sensors will for example, identify moisture levels in the George Massey tunnels as well as structural challenges. Information will be shared with Richmond and interested stakeholders. The project will create a Data Commons and digital twining or simulations for each scenario.

Current Stakeholders include: MDA; Amazon; EMBC; Fortis BC; BC Hydro; Vancouver International Airport; TransLink; BC Ministry of Forests, Lands and Natural Resources Operations; BC Ministry of Transportation and Infrastructure; BC Ministry of Jobs, Trade and Technology; BC Chief Information Office; Industry Canada; Environment Canada; Musqueam Indian Band; Fraser Basin Council; Simon Fraser University; Kwantlen Polytechnic University; University of British Columbia; BC Institute of Technology; Local tech companies (start-ups); Lightship; IBM; Weather Company; insurance companiesa (tbd).

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Data Sharing Agreement: Data sharing agreements will be negotiated and a Data Commons will be created to create legacy information that broadens the awareness to make effective decisions.

MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE ("MOTI")

Structural Health Monitoring (SHM). MOTI has sensors on all Richmond Provincial bridges, highways (99 and (91)) and the George Massey Tunnel that monitor motion in real time. Data would be shared with the Richmond Operations Centre for post disaster assessment. Other sensors will be added to monitor pollution levels, water levels, traffic counts and obstruction.

Strong Motion (SM): MOTI has 160 sensors across BC and 13 sensors installed in the ground across the Richmond that monitor motion in real time. The sensors measure seismic events and create shake maps which enable the city to predict other potential damage in areas of the city. Richmond will receive a customized report within five minutes of an earthquake over a magnitude of 5.0. Richmond will work with MOTI to ensure power to sensors for 72 hours as well as increase the number of sensors to ensure accuracy of assessment post disaster. http://www.bcsims.ca/

Data Sharing Agreement: Data sharing agreements will be negotiated for information that broadens the awareness to make effective decisions for stakeholders.

MINISTRY OF JOBS, TRADE AND TECHNOLOGY

Intelligent Field Operations Digital Platform: The Province has established the Provincial Emergency Management Technology Cluster and has secured the BC technology company Lightship, as well as IBM to develop an operational platform that will integrate site sensors, workers, and data into a functional platform to meet the needs of flooding and wildfire response across the Province. Richmond will integrate SCADA information, Provincial information and that of our key government stakeholders will be used to improve the situational awareness of our island and facilitate remote decision making when needed.

Innovation Superclusters Initiative Project:

This project is detailed under "Emergency Management BC".

Data Sharing Agreement: Data sharing agreements and a legacy Data Commons will be negotiated for information that broadens the awareness of staff to make effective decisions.

TRANSLINK

Electrification of Richmond for Buses and Trucks: TransLink will work with the City and other stakeholders to develop fast charging station for buses, a fast charging station for buses.

Data Sharing Agreement: Information includes transportation route and interruption information.

Bike Storage Facility: TransLink will work with Richmond to install bike storage lockers at the Canada Line Stations to supplement the locations already in Richmond. The public will be able to find and book a free locker online.

Innovative Superclusters Initiative

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VANCOUVER FRASER PORT AUTHORITY ("VFPA"):

EV Charging stations: VFPA will add a fast charging station for trucks, personal vehicles and e-bikes with sensors to monitor availability.

Monitoring High Risk Areas Proof-of-Concept Project with MDA, CN Rail and YVR: This project will monitor high risk areas such as the Jet fuel pipeline and holding facility, railway crossings and track spills on the Fraser River. The project will install cameras, as well as environmental, motion and pressure sensors on pipes and holding tanks as well as railway crossings to monitor leakage, movement of soil and fire. This project will eventually link in to the MDA led Innovation Superclusters Initiative project.

Smart Streets: VFPA will work with Richmond to identify key risk areas to implement smart street lights to improve traffic flow and safety.

Data Sharing Agreement: Information includes the cargo that may be hazardous transported by truck, rail or ship.

Innovative Superclusters Initiative

VANCOUVER AIRPORT AUTHORITY ("YVR")

EV Charging Stations: YVR will add a fast charging station for personal vehicles and e-bikes with sensors to monitor availability.

Data Sharing Agreement: Information includes the cargo that may be hazardous transported by truck or plane.

Monitoring High Risk Areas Proof-of-Concept Project with MDA, CN Rail and YVR: This project will monitor high risk areas such as the Jet fuel pipeline and holding facility, railway crossings and spills on the Fraser River. The project will install cameras, as well as environmental, motion and pressure sensors on pipes and holding tanks as well as railway crossing to monitor leakage, movement of soil and fire. This project will eventually link in to the MDA led Innovation Superclusters Initiative project.

Innovative Superclusters Initiative

BC HYDRO

Power Supply Awareness: This project will integrate SCADA data including power to emergency assets, Provincial data and BC Hydro Smart Meters to predict power supply across the City.

Data Sharing Agreement: Information includes Smart Meters and grid effectiveness.

KWANTLEN POLYTECHNIC UNIVERSITY ("KPU")

Emergency Non-verbal communication: KPU will contribute to a stakeholder engagement/needs assessment process to incorporate design thinking into determining what communication tools would be most effective to ensure social equity in emergency communications. KPU will be further involved in developing the design brief to outline the tools which best address the needs identified through the stakeholder engagement process.

Early Warning System Pilot Project Liquefaction: KPU will investigate the most effective sensors to evaluate ground movement during a seismic event that will be integrated into the

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post disaster assessment. This project will be linked into the MDA led Superclusters project and the PPR program with EMBC.

Design of the Intelligent Operations HUB: KPU through the Wilson School of Design will help develop the plan for the operations centre to ensure functionality and maximize space.

Innovative Superclusters Initiative

BRITISH COLUMBIA INSTITUTE OF TECHNOLOGY ("BCIT")

Drone Program: BCIT has a well-developed and award-winning drone programming and repair program. They work with us on implementing the drone program for dike assessment, emergency response and post disaster assessment.

CANADIAN COAST GUARD AND DEPARTMENT OF NATIONAL DEFENSE

Data Sharing Agreement

See Chapter 4 for listing of pilot projects and proof of concepts.

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TELUS PureFibre

TELUS Company Description
TELUS (TSX: T, NYSE: TU) is one of Canada's largest telecommunications companies, with $14.1 billion of annual revenue and 13.3 million subscriber connections, including 9.2 million wireless subscribers, 1.8 million high-speed Internet subscribers, 1.3 million residential network access lines and 1.1 million TELUS TV customers. TELUS provides a wide range of communications products and services, including wireless, data, Internet Protocol (IP), voice, television, entertainment, video and home and business security. TELUS is also Canada's largest healthcare IT provider, and TELUS International delivers business process solutions around the globe.

PureFibre Project Description (focus on Richmond)
TELUS is investing $110 million to connect more than 90 per cent of homes and businesses in Richmond and Steveston directly to its fibre optic network. Construction work is currently underway, and TELUS anticipates connecting the majority of homes and businesses by the spring of 2019.

The gigabit-enabled TELUS PureFibre network is among the most advanced communications infrastructure available in the world today, enabling residents to immediately take advantage of dramatically faster Internet speeds of at least 150 megabits per second, while businesses, schools, healthcare providers and other institutions can access even more speed and capacity. The TELUS PureFibre network offers symmetrical service, which provides significant benefits for applications like video conferencing, gaming, home security, retail and healthcare. As demand and Internet technologies evolve in the coming years the TELUS PureFibre network will continuously enable offer faster speeds and more capacity.

Local healthcare providers, educators and technology companies will be able to draw upon the technology to reimagine how they deliver existing services and develop entirely new solutions. This new fibre optic infrastructure will also be the backbone of TELUS' wireless network, enabling more wireless capacity and faster speeds throughout the region, and lays the groundwork for 5G technologies in the years ahead.

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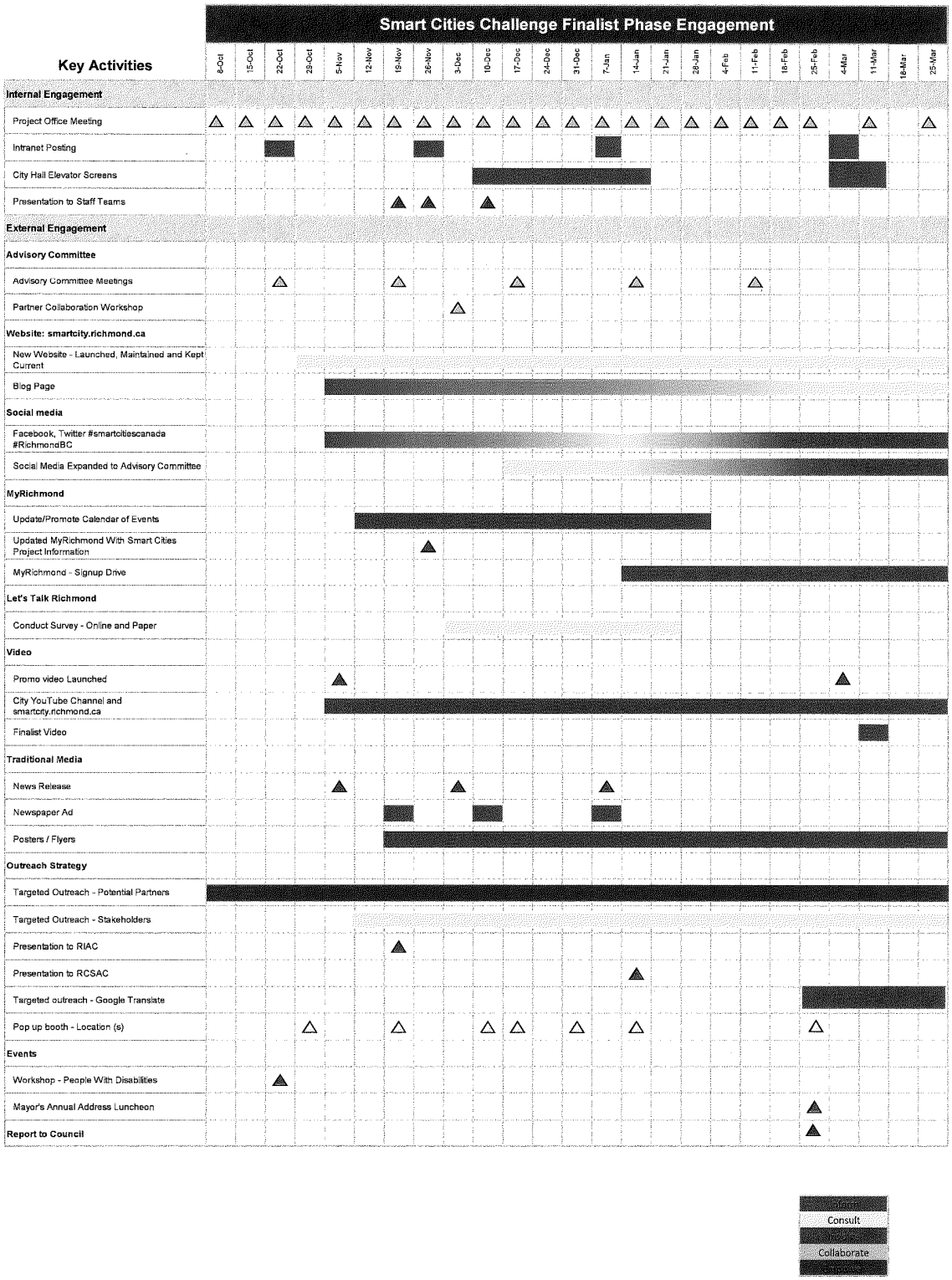

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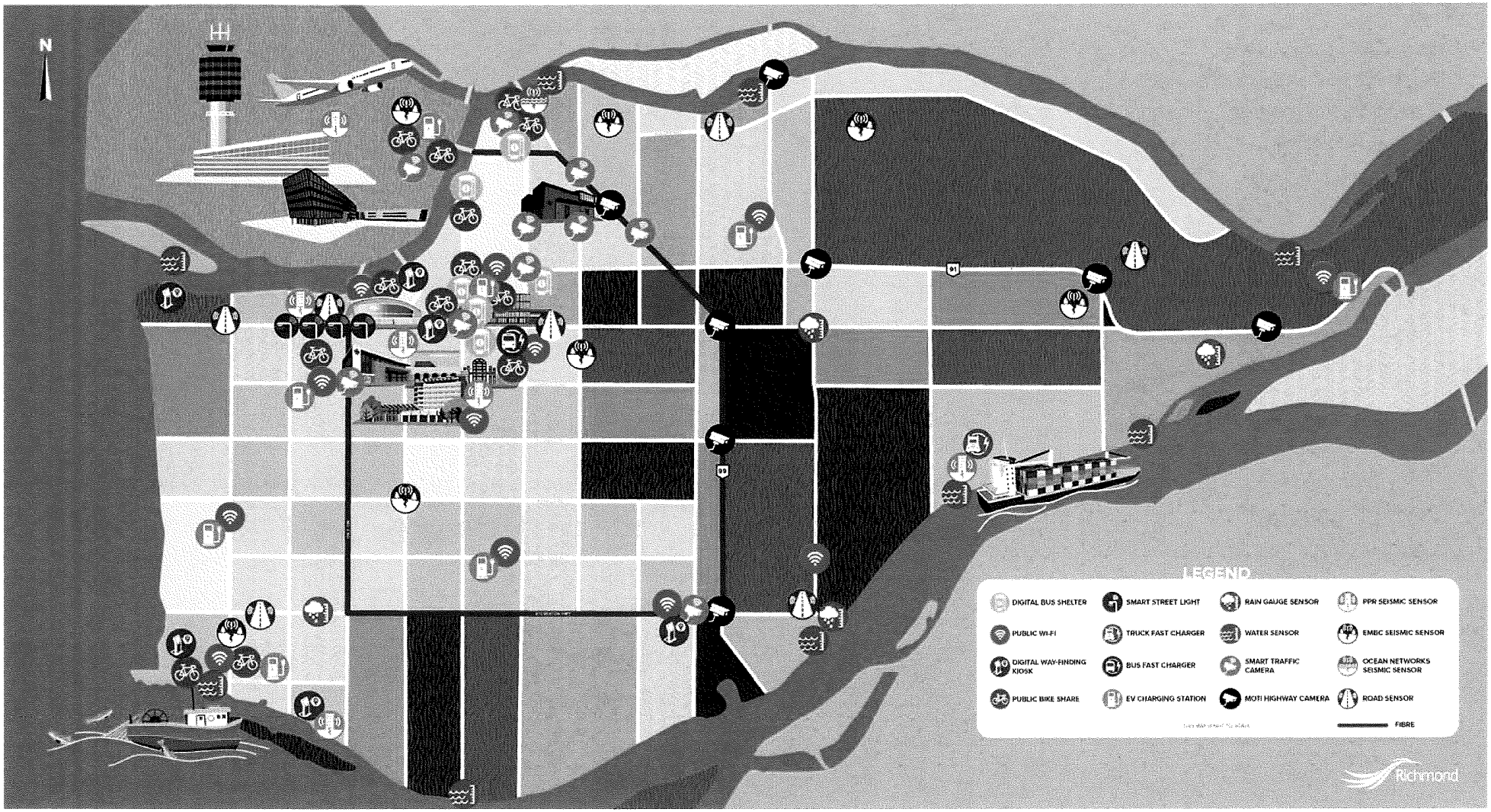

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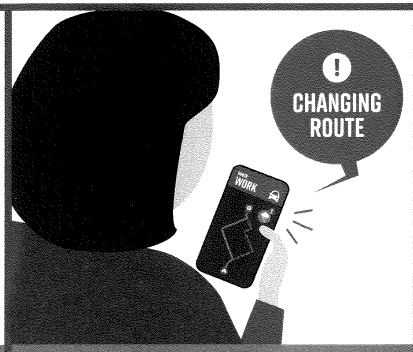
A DAY IN THE LIFE: JENNIFER

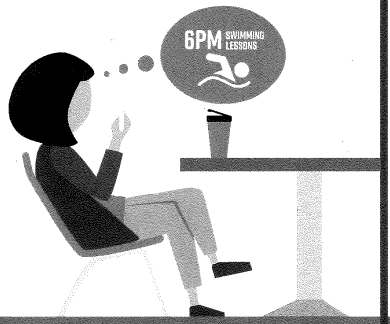
MORNING

Jennifer uses her favourite Smartphone map app to check her morning commute route.



Taking into account the extreme rainfall last night, her app provides a route that is the least congested and avoids localized flooding.

As she gets closer to her City Centre office, she uses her app to find the closest available parking spot.



On her coffee break, Jennifer uses the MyRichmond app to book swimming lessons.

When she logs in with a single sign-on to her customized dashboard, she sees a notification that her dog licence is up for renewal and she is able to process that quickly.

AFTERNOON

On her lunch break, she goes for a walk along the Middle Arm Trail and uses the City digital way-finding kiosk and her MyRichmond app to explore an area that she's less familiar with.

She gets a reminder from MyRichmond about a festival that she plans on attending with her family.

EVENING

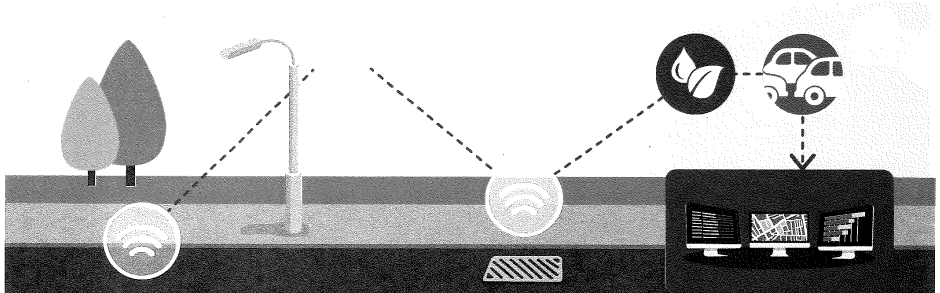
In the evening, Jennifer uses her Smartphone to find the best transit route to get her family to the festival venue.

While waiting at the bus shelter, she checks out the digital display and discovers that there is an upcoming Resilient Communities workshop in her neighbourhood.

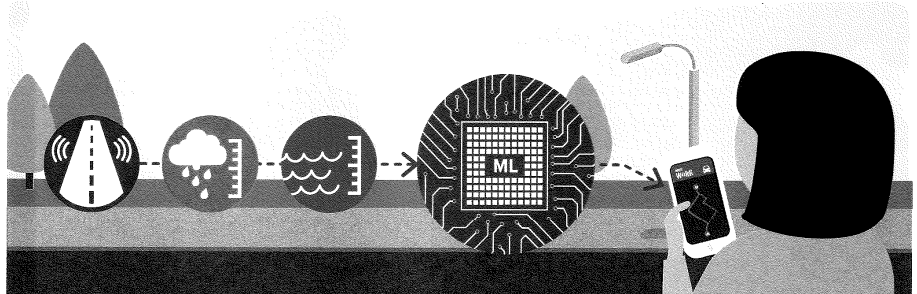
When the festival is over and the large crowd is exiting the venue, Jennifer uses the MyRichmond app...

...and strategically placed way-finding signage to guide her family to a bus that gets them home quickly.

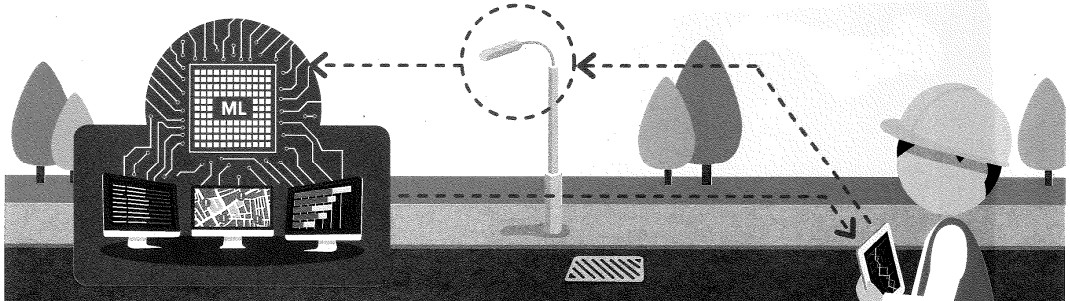
COLLECT, CONNECT, CRUNCH, COMMUNICATE



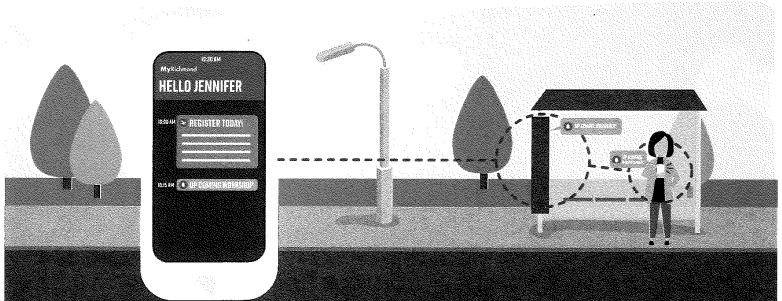
Sensors on roads, lamp posts, and in storm drains collect environmental and traffic information to send back to the City's Intelligent Operations Hub.



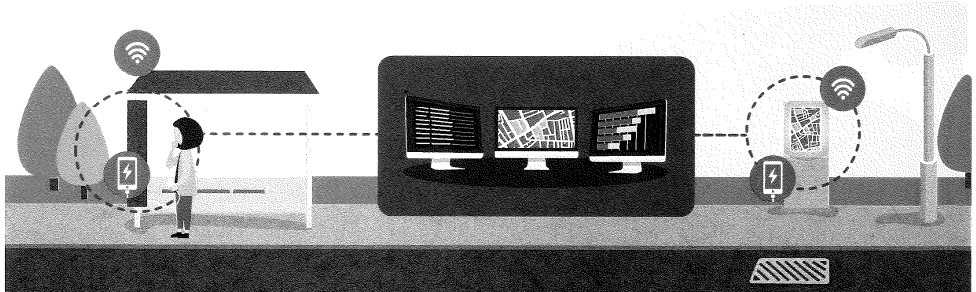
Information on road conditions and water levels affected by the extreme rainfall last night are combined with partners' data and processed through Machine Learning (ML) to become traffic congestion and localized flooding map data. This information is shared through Open (Application Program Interface) API with external systems, including the ones serving Jennifer's favourite Map app.



The Hub's ML software is also capable of deducing specific insights to aid staff in day-to-day operations. These insights include data on power supplies to City assets, lamppost tilt and potential incident sites.

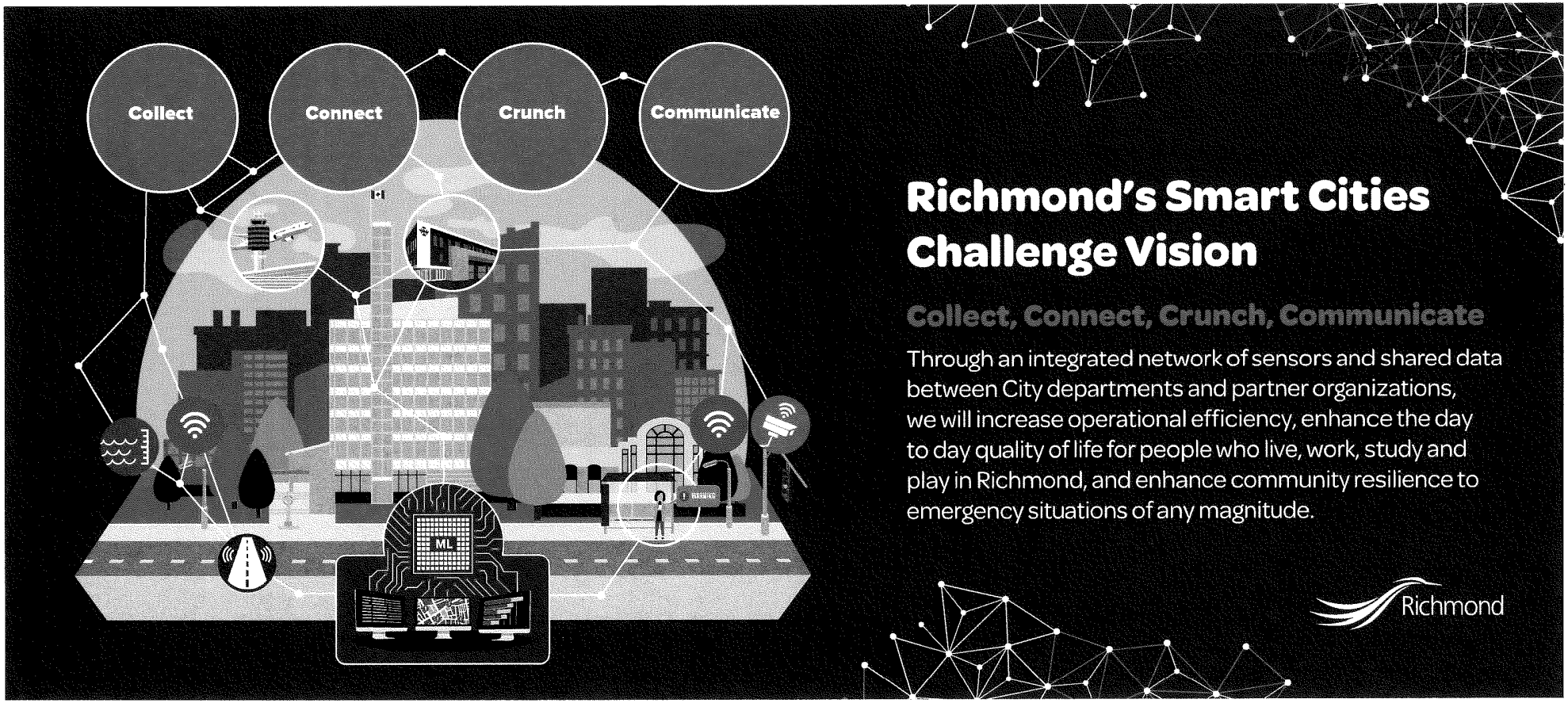


APIs connect the MyRichmond app with the recreation program registration system and the digital signage system to provide seamless registration and way-finding services. The Intelligent Operations Hub schedules and pushes reminder alerts to Jennifer's MyRichmond app.



The smart bus shelters and way-finding kiosks are connected to the Intelligent Operations Hub to display City event information. They also act as Wi-Fi internet hotspots and provide smartphone charging.

Data-sharing enabled through the Intelligent Operations Hub with agencies such as TransLink and Emergency Management BC allows early detection and warning of disasters. The interconnectivity between governments and agencies will improve emergency response coordination.



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Richmond's Smart Cities Challenge Statement

Richmond, an island city with a rapidly growing and diverse population and home of nationally significant infrastructure and government services, requires resilient physical and virtual platforms that are integrated seamlessly across all levels of government to enhance quality of life in day-to-day activities and minimize community impacts from major disasters.

Thank you to the many stakeholders and community members who have contributed ideas and feedback that have guided the development of our final proposal. A special thank you to the members of our Smart Cities Challenge Advisory Committee.

Find out more about Richmond's Smart Cities Challenge journey at smartcity.richmond.ca.

AMERESCO AWARE 360 BC Hydro Power smart BCIT British Columbia

KPU MDA Ocean Networks Canada Port Metro Vancouver

Sierra Wireless SNC·Lavalin TELUS TIBCO TRANSOFT Solutions

TransLink URBAN LOGIQ YVR Smart Cities Challenge Richmond

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City of Richmond
Smart Cities Challenge
Budget

			Year Start	2019/01/01	2020/01/01	2021/01/01	2022/01/01	2023/01/01	2024/01/01
			Year End	2019/12/31	2020/12/31	2021/12/31	2022/12/31	2023/12/31	2024/12/31
			Year	2019	2020	2021	2022	2023	2024
			Period	1	2	3	4	5	6
1 PROJECTS TIMING									
			Switch						
	1.1 - Smart Streets		ON	1	1	1	1	1	1
	1.2 - Sustainable Transportation		ON	1	1	1	1	1	1
	2.1 - Integrated Smart Alerts and Post Disaster Assessment		ON	1	1	1	1	1	1
	2.2 - Resilient Energy Source for Emergency Assets		ON	1	1	1	1	1	1
	2.3 - Integrated Municipal Operations Hub		ON	1	1	1	1	1	1
	3.1 - MyRichmond		ON	1	1	1	1	1	1
	3.2 - Integrated Communication Tools		ON	1	1	1	1	1	1
	3.3 - Smart Way-Finding Solutions		ON	1	1	1	1	1	1
2 INFLATION PROFILE									
	Inflation Profile			1.000	1.025	1.051	1.077	1.104	1.131
3 SUMMARY ESCALATED COSTS AND REVENUES			**Total**						
All Active Projects									
CAPEX									
Hard	Construction - Hard Cost		34,458,229	1,806,283	5,728,603	8,305,643	10,463,748	6,180,776	1,973,176
Soft	Construction - Soft Cost		5,609,990	919,126	983,722	859,927	1,161,317	1,352,963	332,936
Hard	Technology - Hard Cost		16,831,741	5,973,339	4,258,756	2,905,653	1,838,176	1,855,818	-
Soft	Technology - Soft Cost		5,436,689	861,336	2,117,826	2,224,055	163,842	69,629	-
Total CAPEX			**62,336,650**	**9,560,084**	**13,088,906**	**14,295,277**	**13,627,083**	**9,459,186**	**2,306,112**
OPEX and CONTINGENCY									
Contingency	Contingency		11,456,771	1,757,478	2,421,318	2,665,464	2,498,876	1,652,414	461,222
Operating	Operating Cost		7,577,613	257,839	896,149	1,393,225	1,484,916	1,585,817	1,959,666
Total OPEX and Contingency			**19,034,385**	**2,015,317**	**3,317,468**	**4,058,689**	**3,983,791**	**3,238,231**	**2,420,888**
REVENUES									
Funding	Funding from Infrastructure Canada		-	-	-	-	-	-	-
Savings	Savings		3,072,705	133,056	449,584	635,612	776,640	837,040	240,773
Revenue	Financial Inflows excl. Funding from Infrastructure Canada		4,801,000	459,500	828,000	974,500	1,212,000	1,327,000	-
Total Revenues			**7,873,705**	**592,556**	**1,277,584**	**1,610,112**	**1,988,640**	**2,164,040**	**240,773**
All Active Projects Costs - by cost type									
Hard			51,289,970	7,779,622	9,987,359	11,211,295	12,301,924	8,036,594	1,973,176
Soft			11,046,679	1,780,462	3,101,548	3,083,982	1,325,159	1,422,592	332,936
Operating			7,577,613	257,839	896,149	1,393,225	1,484,916	1,585,817	1,959,666
Total Costs			**69,914,262**	**9,817,923**	**13,985,056**	**15,688,503**	**15,111,999**	**11,045,003**	**4,265,777**
All Active Projects Costs - by revenue type									
Funding			-	-	-	-	-	-	-
Savings			3,072,705	133,056	449,584	635,612	776,640	837,040	240,773
Revenue			4,801,000	459,500	828,000	974,500	1,212,000	1,327,000	-
Total Revenues			**7,873,705**	**592,556**	**1,277,584**	**1,610,112**	**1,988,640**	**2,164,040**	**240,773**
4 ESCALATED PROJECT COSTS AND REVENUES			**Total**						
Project	**1.1-1 - Smart Street Lights**								
CAPEX									
Hard	Construction - Hard Cost		4,093,634	634,626	832,991	853,816	875,161	897,040	-
Soft	Construction - Soft Cost		293,679	146,240	35,506	36,394	37,303	38,236	-
Hard	Technology - Hard Cost		1,564,283	297,600	305,040	312,666	320,483	328,495	-
Soft	Technology - Soft Cost		15,003	936	1,919	2,950	4,032	5,166	-
Total CAPEX			**5,966,599**	**1,079,402**	**1,175,456**	**1,205,825**	**1,236,979**	**1,268,937**	**-**
OPEX and CONTINGENCY									
Contingency	Contingency		894,990	161,910	176,318	180,874	185,547	190,341	-
Operating	Operating Cost		20,922	-	-	-	-	10,332	10,590
Total OPEX and Contingency			**915,911**	**161,910**	**176,318**	**180,874**	**185,547**	**200,672**	**10,590**
REVENUES									
Funding	Funding from Infrastructure Canada		-						
Savings	Savings		876,672	73,056	109,584	146,112	182,640	182,640	182,640
Revenue	Financial Inflows excl. Funding from Infrastructure Canada		160,000	40,000	40,000	40,000	40,000	-	-
Total Revenues			**1,036,672**	**113,056**	**149,584**	**186,112**	**222,640**	**182,640**	**182,640**
Net Cashflow				(48,854)	(26,734)	5,238	37,093	(18,032)	172,050

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City of Richmond
Smart Cities Challenge
Budget

		Year Start Year End Year	2019/01/01 2019/12/31 2019	2020/01/01 2020/12/31 2020	2021/01/01 2021/12/31 2021	2022/01/01 2022/12/31 2022	2023/01/01 2023/12/31 2023	2024/01/01 2024/12/31 2024
Project	**1.1-2 - Fibre optics cable and deploy smart cameras**							
CAPEX								
Hard	Construction - Hard Cost	33,852	8,152	8,356	8,565	8,779	-	-
Soft	Construction - Soft Cost	-	-	-	-	-	-	-
Hard	Technology - Hard Cost	133,782	82,383	16,712	17,130	17,558	-	-
Soft	Technology - Soft Cost	-	-	-	-	-	-	-
Total CAPEX		**167,634**	**90,535**	**25,068**	**25,695**	**26,337**	**-**	**-**
OPEX and CONTINGENCY								
Contingency	Contingency	25,145	13,580	3,760	3,854	3,951	-	-
Operating	Operating Cost	-	-	-	-	-	-	-
Total OPEX and Contingency		**25,145**	**13,580**	**3,760**	**3,854**	**3,951**	**-**	**-**
REVENUES								
Funding	Funding from Infrastructure Canada	-						
Savings	Savings	300,000	60,000	60,000	60,000	60,000	60,000	-
Revenue	Financial Inflows excl. Funding from Infrastructure Canada	-	-	-	-	-	-	-
Total Revenues		**300,000**	**60,000**	**60,000**	**60,000**	**60,000**	**60,000**	**-**
Net Cashflow			46,420	56,240	56,146	56,049	60,000	-
Project	**1.1-3 - Information flow from sensor to central Hub**							
CAPEX								
Hard	Construction - Hard Cost	-	-	-	-	-	-	-
Soft	Construction - Soft Cost	-	-	-	-	-	-	-
Hard	Technology - Hard Cost	319,950	60,870	62,391	63,951	65,550	67,189	-
Soft	Technology - Soft Cost	-	-	-	-	-	-	-
Total CAPEX		**319,950**	**60,870**	**62,391**	**63,951**	**65,550**	**67,189**	**-**
OPEX and CONTINGENCY								
Contingency	Contingency	47,993	9,130	9,359	9,593	9,832	10,078	-
Operating	Operating Cost	-	-	-	-	-	-	-
Total OPEX and Contingency		**47,993**	**9,130**	**9,359**	**9,593**	**9,832**	**10,078**	**-**
REVENUES								
Funding	Funding from Infrastructure Canada	-						
Savings	Savings	-	-	-	-	-	-	-
Revenue	Financial Inflows excl. Funding from Infrastructure Canada	-	-	-	-	-	-	-
Total Revenues		**-**	**-**	**-**	**-**	**-**	**-**	**-**
Net Cashflow			(9,130)	(9,359)	(9,593)	(9,832)	(10,078)	-
Project	**1.1-4 - GPS system at signalized intersections**							
CAPEX								
Hard	Construction - Hard Cost	-	-	-	-	-	-	-
Soft	Construction - Soft Cost	22,854	4,348	4,457	4,568	4,682	4,799	-
Hard	Technology - Hard Cost	1,711,264	122,217	382,671	392,238	402,044	412,095	-
Soft	Technology - Soft Cost	-	-	-	-	-	-	-
Total CAPEX		**1,734,118**	**126,565**	**387,127**	**396,806**	**406,726**	**416,894**	**-**
OPEX and CONTINGENCY								
Contingency	Contingency	260,118	18,985	58,069	59,521	61,009	62,534	-
Operating	Operating Cost	178,156	3,680	33,194	34,023	34,874	35,746	36,640
Total OPEX and Contingency		**438,274**	**22,665**	**91,263**	**93,544**	**95,883**	**98,280**	**36,640**
REVENUES								
Funding	Funding from Infrastructure Canada	-						
Savings	Savings	-	-	-	-	-	-	-
Revenue	Financial Inflows excl. Funding from Infrastructure Canada	-	-	-	-	-	-	-
Total Revenues		**-**	**-**	**-**	**-**	**-**	**-**	**-**
Net Cashflow			(22,665)	(91,263)	(93,544)	(95,883)	(98,280)	(36,640)

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City of Richmond
Smart Cities Challenge
Budget

		Year Start Year End Year	2019/01/01 2019/12/31 2019	2020/01/01 2020/12/31 2020	2021/01/01 2021/12/31 2021	2022/01/01 2022/12/31 2022	2023/01/01 2023/12/31 2023	2024/01/01 2024/12/31 2024
Project	**1.1-5 - Advanced Traffic Management System Enhancements**							
CAPEX								
Hard	Construction - Hard Cost	-	-	-	-	-	-	-
Soft	Construction - Soft Cost	-	-	-	-	-	-	-
Hard	Technology - Hard Cost	3,058,303	602,957	591,291	606,074	621,225	636,756	-
Soft	Technology - Soft Cost	-	-	-	-	-	-	-
Total CAPEX		**3,058,303**	**602,957**	**591,291**	**606,074**	**621,225**	**636,756**	**-**
OPEX and CONTINGENCY								
Contingency	Contingency	458,745	90,443	88,694	90,911	93,184	95,513	-
Operating	Operating Cost	614,820	96,250	98,656	101,123	103,651	106,242	108,898
Total OPEX and Contingency		**1,073,565**	**186,693**	**187,350**	**192,034**	**196,835**	**201,755**	**108,898**
REVENUES								
Funding	Funding from Infrastructure Canada	-						
Savings	Savings	-	-	-	-	-	-	-
Revenue	Financial Inflows excl. Funding from Infrastructure Canada	700,000	140,000	140,000	140,000	140,000	140,000	-
Total Revenues		**700,000**	**140,000**	**140,000**	**140,000**	**140,000**	**140,000**	**-**
Net Cashflow			(46,693)	(47,350)	(52,034)	(56,835)	(61,755)	(108,898)
Project	**1.1-6 - Uniterruptible Battery Backup System at intersections**							
CAPEX								
Hard	Construction - Hard Cost	1,005,558	191,304	196,087	200,989	206,014	211,164	-
Soft	Construction - Soft Cost	-	-	-	-	-	-	-
Hard	Technology - Hard Cost	1,860,283	353,913	362,761	371,830	381,126	390,654	-
Soft	Technology - Soft Cost	-	-	-	-	-	-	-
Total CAPEX		**2,865,842**	**545,217**	**558,848**	**572,819**	**587,139**	**601,818**	**-**
OPEX and CONTINGENCY								
Contingency	Contingency	429,876	81,783	83,827	85,923	88,071	90,273	-
Operating	Operating Cost	122,964	19,250	19,731	20,225	20,730	21,248	21,780
Total OPEX and Contingency		**552,840**	**101,033**	**103,558**	**106,147**	**108,801**	**111,521**	**21,780**
REVENUES								
Funding	Funding from Infrastructure Canada	-						
Savings	Savings	-	-	-	-	-	-	-
Revenue	Financial Inflows excl. Funding from Infrastructure Canada	275,000	55,000	55,000	55,000	55,000	55,000	-
Total Revenues		**275,000**	**55,000**	**55,000**	**55,000**	**55,000**	**55,000**	**-**
Net Cashflow			(46,033)	(48,558)	(51,147)	(53,801)	(56,521)	(21,780)
Project	**1.2-1 - Increase EV use and ownership**							
CAPEX								
Hard	Construction - Hard Cost	1,794,615	-	230,625	551,578	565,368	447,044	-
Soft	Construction - Soft Cost	1,029,710	228,000	181,169	196,204	201,109	186,268	36,959
Hard	Technology - Hard Cost	-	-	-	-	-	-	-
Soft	Technology - Soft Cost	-	-	-	-	-	-	-
Total CAPEX		**2,824,325**	**228,000**	**411,794**	**747,782**	**766,477**	**633,313**	**36,959**
OPEX and CONTINGENCY								
Contingency	Contingency	564,865	45,600	82,359	149,556	153,295	126,663	7,392
Operating	Operating Cost	495,331	-	24,703	80,793	139,673	186,456	63,706
Total OPEX and Contingency		**1,060,196**	**45,600**	**107,061**	**230,350**	**292,968**	**313,119**	**71,098**
REVENUES								
Funding	Funding from Infrastructure Canada	-						
Savings	Savings	471,033	-	25,000	79,500	134,000	174,400	58,133
Revenue	Financial Inflows excl. Funding from Infrastructure Canada	416,000	-	56,000	130,000	130,000	100,000	-
Total Revenues		**887,033**	**-**	**81,000**	**209,500**	**264,000**	**274,400**	**58,133**
Net Cashflow			(45,600)	(26,061)	(20,850)	(28,968)	(38,719)	(12,965)

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City of Richmond
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Budget

		Year Start Year End Year	2019/01/01 2019/12/31 2019	2020/01/01 2020/12/31 2020	2021/01/01 2021/12/31 2021	2022/01/01 2022/12/31 2022	2023/01/01 2023/12/31 2023	2024/01/01 2024/12/31 2024
Project	**1.2-2 - Mobility Hubs**							
CAPEX								
Hard	Construction - Hard Cost	623,654	-	-	-	-	623,654	-
Soft	Construction - Soft Cost	327,485	115,000	35,875	-	-	176,610	-
Hard	Technology - Hard Cost	-	-	-	-	-	-	-
Soft	Technology - Soft Cost	-	-	-	-	-	-	-
Total CAPEX		**951,139**	**115,000**	**35,875**	**-**	**-**	**800,264**	**-**
OPEX and CONTINGENCY								
Contingency	Contingency	190,228	23,000	7,175	-	-	160,053	-
Operating	Operating Cost	22,628	-	-	-	-	-	22,628
Total OPEX and Contingency		**212,856**	**23,000**	**7,175**	**-**	**-**	**160,053**	**22,628**
REVENUES								
Funding	Funding from Infrastructure Canada	-						
Savings	Savings	-	-	-	-	-	-	-
Revenue	Financial Inflows excl. Funding from Infrastructure Canada	-	-	-	-	-	-	-
Total Revenues		**-**	**-**	**-**	**-**	**-**	**-**	**-**
Net Cashflow			(23,000)	(7,175)	-	-	(160,053)	(22,628)
Project	**2.1 - Integrated Smart Alerts and Post Disaster Assessment**							
CAPEX								
Hard	Construction - Hard Cost	2,402,625	377,500	386,938	808,981	829,206	-	-
Soft	Construction - Soft Cost	155,925	77,000	78,925	-	-	-	-
Hard	Technology - Hard Cost	705,250	326,000	379,250	-	-	-	-
Soft	Technology - Soft Cost	-	-	-	-	-	-	-
Total CAPEX		**3,263,800**	**780,500**	**845,113**	**808,981**	**829,206**	**-**	**-**
OPEX and CONTINGENCY								
Contingency	Contingency	652,760	156,100	169,023	161,796	165,841	-	-
Operating	Operating Cost	62,280	9,750	9,994	10,244	10,500	10,762	11,031
Total OPEX and Contingency		**715,040**	**165,850**	**179,016**	**172,040**	**176,341**	**10,762**	**11,031**
REVENUES								
Funding	Funding from Infrastructure Canada	-						
Savings	Savings	-						
Revenue	Financial Inflows excl. Funding from Infrastructure Canada	-	-	-	-	-	-	-
Total Revenues		**-**	**-**	**-**	**-**	**-**	**-**	**-**
Net Cashflow			(165,850)	(179,016)	(172,040)	(176,341)	(10,762)	(11,031)
Project	**2.2 - Resilient Energy Source for Emergency Assets**							
CAPEX								
Hard	Construction - Hard Cost	9,459,263	-	1,808,100	1,853,303	1,899,635	1,925,050	1,973,176
Soft	Construction - Soft Cost	1,418,889	-	271,215	277,995	284,945	288,757	295,976
Hard	Technology - Hard Cost	-	-	-	-	-	-	-
Soft	Technology - Soft Cost	-	-	-	-	-	-	-
Total CAPEX		**10,878,153**	**-**	**2,079,315**	**2,131,298**	**2,184,580**	**2,213,807**	**2,269,152**
OPEX and CONTINGENCY								
Contingency	Contingency	2,175,631	-	415,863	426,260	436,916	442,761	453,830
Operating	Operating Cost	438,986	-	-	-	-	-	438,986
Total OPEX and Contingency		**2,614,617**	**-**	**415,863**	**426,260**	**436,916**	**442,761**	**892,817**
REVENUES								
Funding	Funding from Infrastructure Canada	-						
Savings	Savings	-						
Revenue	Financial Inflows excl. Funding from Infrastructure Canada	-	-	-	-	-	-	-
Total Revenues		**-**	**-**	**-**	**-**	**-**	**-**	**-**
Net Cashflow			-	(415,863)	(426,260)	(436,916)	(442,761)	(892,817)

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City of Richmond
Smart Cities Challenge
Budget

		Year Start Year End Year	2019/01/01 2019/12/31 2019	2020/01/01 2020/12/31 2020	2021/01/01 2021/12/31 2021	2022/01/01 2022/12/31 2022	2023/01/01 2023/12/31 2023	2024/01/01 2024/12/31 2024
Project	**2.3 - Integrated Municipal Operations Hub**							
CAPEX								
Hard	Construction - Hard Cost	10,587,289	500,000	1,537,500	3,151,875	4,846,008	551,906	-
Soft	Construction - Soft Cost	1,791,092	330,000	338,250	294,175	409,218	419,449	-
Hard	Technology - Hard Cost	5,037,436	2,434,000	1,555,438	1,047,998	-	-	-
Soft	Technology - Soft Cost	4,967,724	800,000	2,050,000	2,117,724	-	-	-
Total CAPEX		**22,383,541**	**4,064,000**	**5,481,188**	**6,611,772**	**5,255,226**	**971,355**	-
OPEX and CONTINGENCY								
Contingency	Contingency	4,476,708	812,800	1,096,238	1,322,354	1,051,045	194,271	-
Operating	Operating Cost	3,911,003	-	408,975	838,399	859,359	890,998	913,273
Total OPEX and Contingency		**8,387,711**	**812,800**	**1,505,213**	**2,160,753**	**1,910,404**	**1,085,269**	**913,273**
REVENUES								
Funding	Funding from Infrastructure Canada	-						
Savings	Savings	-						
Revenue	Financial Inflows excl. Funding from Infrastructure Canada	-	-	-	-	-	-	-
Total Revenues		-	-	-	-	-	-	-
Net Cashflow			(812,800)	(1,505,213)	(2,160,753)	(1,910,404)	(1,085,269)	(913,273)
Project	**3.1 - MyRichmond**							
CAPEX								
Hard	Construction - Hard Cost	-	-	-	-	-	-	-
Soft	Construction - Soft Cost	-	-	-	-	-	-	-
Hard	Technology - Hard Cost	1,374,891	1,200,000	148,625	26,266	-	-	-
Soft	Technology - Soft Cost	149,280	28,400	29,110	29,838	30,584	31,348	-
Total CAPEX		**1,524,170**	**1,228,400**	**177,735**	**56,103**	**30,584**	**31,348**	-
OPEX and CONTINGENCY								
Contingency	Contingency	304,834	245,680	35,547	11,221	6,117	6,270	-
Operating	Operating Cost	-	-	-	-	-	-	-
Total OPEX and Contingency		**304,834**	**245,680**	**35,547**	**11,221**	**6,117**	**6,270**	-
REVENUES								
Funding	Funding from Infrastructure Canada	-						
Savings	Savings	-						
Revenue	Financial Inflows excl. Funding from Infrastructure Canada	-	-	-	-	-	-	-
Total Revenues		-	-	-	-	-	-	-
Net Cashflow			(245,680)	(35,547)	(11,221)	(6,117)	(6,270)	-
Project	**3.2 - Integrated Communication Tools**							
CAPEX								
Hard	Construction - Hard Cost	-	-	-	-	-	-	-
Soft	Construction - Soft Cost	-	-	-	-	-	-	-
Hard	Technology - Hard Cost	300,349	53,400	128,627	67,501	30,191	20,630	-
Soft	Technology - Soft Cost	-	-	-	-	-	-	-
Total CAPEX		**300,349**	**53,400**	**128,627**	**67,501**	**30,191**	**20,630**	-
OPEX and CONTINGENCY								
Contingency	Contingency	60,070	10,680	25,725	13,500	6,038	4,126	-
Operating	Operating Cost	1,322,606	128,909	227,097	232,774	238,594	244,559	250,673
Total OPEX and Contingency		**1,382,675**	**139,589**	**252,822**	**246,274**	**244,632**	**248,685**	**250,673**
REVENUES								
Funding	Funding from Infrastructure Canada	-						
Savings	Savings	-						
Revenue	Financial Inflows excl. Funding from Infrastructure Canada	-	-	-	-	-	-	-
Total Revenues		-	-	-	-	-	-	-
Net Cashflow			(139,589)	(252,822)	(246,274)	(244,632)	(248,685)	(250,673)

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City of Richmond
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Budget

		Year Start Year End Year	2019/01/01 2019/12/31 2019	2020/01/01 2020/12/31 2020	2021/01/01 2021/12/31 2021	2022/01/01 2022/12/31 2022	2023/01/01 2023/12/31 2023	2024/01/01 2024/12/31 2024
Project	**3.3 - Smart Way-Finding Solutions**							
CAPEX								
Hard	Construction - Hard Cost	4,457,738	94,700	728,006	876,536	1,233,578	1,524,918	-
Soft	Construction - Soft Cost	570,355	18,539	38,325	50,590	224,058	238,843	-
Hard	Technology - Hard Cost	765,950	440,000	325,950	-	-	-	-
Soft	Technology - Soft Cost	304,683	32,000	36,798	73,544	129,227	33,114	-
Total CAPEX		**6,098,726**	**585,239**	**1,129,079**	**1,000,671**	**1,586,863**	**1,796,875**	-
OPEX and CONTINGENCY								
Contingency	Contingency	914,809	87,786	169,362	150,101	238,029	269,531	-
Operating	Operating Cost	387,917	-	73,800	75,645	77,536	79,475	81,461
Total OPEX and Contingency		**1,302,726**	**87,786**	**243,162**	**225,746**	**315,566**	**349,006**	**81,461**
REVENUES								
Funding	Funding from Infrastructure Canada	-						
Savings	Savings	1,425,000	-	255,000	350,000	400,000	420,000	-
Revenue	Financial Inflows excl. Funding from Infrastructure Canada	3,250,000	224,500	537,000	609,500	847,000	1,032,000	-
Total Revenues		**4,675,000**	**224,500**	**792,000**	**959,500**	**1,247,000**	**1,452,000**	-
Net Cashflow			136,714	548,838	733,754	931,434	1,102,994	(81,461)

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City of Richmond - Smart Cities Challenge - Project Budget

1.1 Smart Streets | *1. Smart Street Lights*

CONSTRUCTION COST

Construction - Hard Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total	2019	2020	2021	2022	2023	2024
LED Installation & Commissioning - Luminarie Cost	Comparative	Electrical Dept.	Based on previous projects	1,727,880	255,000	368,220	368,220	368,220	368,220	
LED Installation & Commissioning - Installation Cost	Comparative	Electrical Dept.	Based on previous projects	989,362	146,010	210,838	210,838	210,838	210,838	
Smart Street Lights Installation & Commissioning	Comparative	Electrical Dept.	Light controller installation and provisioning	1,168,080	233,616	233,616	233,616	233,616	233,616	
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Construction - Hard Cost				**3,885,322**	**634,626**	**812,674**	**812,674**	**812,674**	**812,674**	**0**

Construction - Soft Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total	2019	2020	2021	2022	2023	2024
Project/Installation Management (Salaries)	Quote	Manufacturer	12,000 Standard Units	190,000	110,000	20,000	20,000	20,000	20,000	
Enpoint Activation Fee	Quote	Manufacturer	12,000 Standard Units	73,200	14,640	14,640	14,640	14,640	14,640	
Project Development Fee	Quote	Manufacturer	12,000 Standard Units	18,000	18,000					
CMS Training Fee	Quote	Manufacturer	12,000 Standard Units	3,600	3,600					
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Construction - Soft Cost				**284,800**	**146,240**	**34,640**	**34,640**	**34,640**	**34,640**	**0**
TOTAL CONSTRUCTION COST				**4,170,122**	**780,866**	**847,314**	**847,314**	**847,314**	**847,314**	**0**

TECHNOLOGY COST

Technology - Hard Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total	2019	2020	2021	2022	2023	2024
Acuity Monthly SaaS Fee	Quote	Manufacturer	12,000 Standard Units	1,488,000	297,600	297,600	297,600	297,600	297,600	
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Technology - Hard Cost				**1,488,000**	**297,600**	**297,600**	**297,600**	**297,600**	**297,600**	**0**

Technology - Soft Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total	2019	2020	2021	2022	2023	2024
Acuity Monthly SaaS Fee	Quote	Manufacturer	12,000 Standard Units	14,040	936	1,872	2,808	3,744	4,680	
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Technology - Soft Cost				**14,040**	**936**	**1,872**	**2,808**	**3,744**	**4,680**	**0**
TOTAL TECHNOLOGY COST				**1,502,040**	**298,536**	**299,472**	**300,408**	**301,344**	**302,280**	**0**

CONTINGENCY

Contingency

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total	2019	2020	2021	2022	2023	2024
Contingency			15%	850,824	161,910	172,018	172,158	172,299	172,439	0
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Contingency				**850,824**	**161,910**	**172,018**	**172,158**	**172,299**	**172,439**	**0**

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City of Richmond - Smart Cities Challenge - Project Budget

1.1 Smart Streets	*1. Smart Street Lights*									
	Methods	Sources	Assumptions	Total	2019	2020	2021	2022	2023	2024
OPERATING COST (OPERATING BUDGET IMPACT (OBI))										
Operating Budget Impact (OBI)										
Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Annual licensing fees (PaaS[SaaS+NaaS])	Quote	Manufacturer	12,000 Standard Units	18,720	0	0	0	0	9,360	9,360
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Operating Budget Impact (OBI)				**18,720**	**0**	**0**	**0**	**0**	**9,360**	**9,360**
TOTAL COSTS				**6,541,706**	**1,241,312**	**1,318,804**	**1,319,880**	**1,320,957**	**1,331,393**	**9,360**
REVENUES AND OTHER FINANCIAL INFLOWS										
Financial Inflows to the Organization										
Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Near firm third-party partner contribution or grant				160,000	40,000	40,000	40,000	40,000	0	0
Electrical Savings from switching to LED	Estimate	per kWhour price		876,672	73,056	109,584	146,112	182,640	182,640	182,640
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Financial Inflows to the Organization				**1,036,672**	**113,056**	**149,584**	**186,112**	**222,640**	**182,640**	**182,640**
NET CASH-FLOW (Revenue - Costs)				**(5,505,034)**	**(1,128,256)**	**(1,169,220)**	**(1,133,768)**	**(1,098,317)**	**(1,148,753)**	**173,280**

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City of Richmond - Smart Cities Challenge - Project Budget

1.1 Smart Streets | *2. Install Fibre Optic Cable and Deploy CCTV Cameras*

CONSTRUCTION COST

Construction - Hard Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total	2019	2020	2021	2022	2023	2024
Smart Camera Installation	Estimated $1,500 per intersection	Vendor	15 locations	19,565	4,891	4,891	4,891	4,891		
Fibre enclosure/splicing/terminations	intersection	Fibre Cable Contractor	15 locations	13,043	3,261	3,261	3,261	3,261		
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Construction - Hard Cost				32,609	8,152	8,152	8,152	8,152	0	0

Construction - Soft Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Project Management			leveraging existing	0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Construction - Soft Cost				0	0	0	0	0	0	0
TOTAL CONSTRUCTION COST				32,609	8,152	8,152	8,152	8,152	0	0

TECHNOLOGY COST

Technology - Hard Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Project Management	$3,000 per intersection	Vendor Quotation	15 locations	39,130	9,783	9,783	9,783	9,783		
Managed Fibre Network Switch	$2,000 per intersection	Vendor Quotation	15 locations	26,087	6,522	6,522	6,522	6,522		
Servers	Vendor Quotation	Vendor Quotation	157TB (39 days recording)	61,383	61,383					
Software and Licensing costs (based on 15 locations)	Vendor Quotation	Vendor Quotation	15 locations	4,696	4,696					
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Technology - Hard Cost				131,296	82,383	16,304	16,304	16,304	0	0

Technology - Soft Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Project Management			leveraging existing	0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Technology - Soft Cost				0	0	0	0	0	0	0
TOTAL TECHNOLOGY COST				131,296	82,383	16,304	16,304	16,304	0	0

CONTINGENCY

Contingency

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Contingency			15%	24,586	13,580	3,668	3,668	3,668	0	0
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Contingency				24,586	13,580	3,668	3,668	3,668	0	0

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City of Richmond - Smart Cities Challenge - Project Budget

1.1 Smart Streets	2. Install Fibre Optic Cable and Deploy CCTV Cameras

OPERATING COST (OPERATING BUDGET IMPACT (OBI))

Operating Budget Impact (OBI)

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total	2019	2020	2021	2022	2023	2024
NA				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Operating Budget Impact (OBI)				0	0	0	0	0	0	0
TOTAL COSTS				188,490	104,115	28,125	28,125	28,125	0	0

REVENUES AND OTHER FINANCIAL INFLOWS

Financial Inflows to the Organization

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Estimated Revenue	Report to Council	GP Committee Agenda Dec. 4, 2017		300,000	60,000	60,000	60,000	60,000	60,000	
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Financial Inflows to the Organization				300,000	60,000	60,000	60,000	60,000	60,000	0
NET CASH-FLOW (Revenue - Costs)				111,510	(44,115)	31,875	31,875	31,875	60,000	0

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City of Richmond - Smart Cities Challenge - Project Budget

1.1 Smart Streets	3. Plan for Information Flow from Sensor Location to Central Hub

CONSTRUCTION COST

Construction - Hard Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total	2019	2020	2021	2022	2023	2024
NA				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Construction - Hard Cost				0	0	0	0	0	0	0

Construction - Soft Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
NA				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Construction - Soft Cost				0	0	0	0	0	0	0
TOTAL CONSTRUCTION COST				0	0	0	0	0	0	0

TECHNOLOGY COST

Technology - Hard Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Project Management	Quotation	UrbanLogiq		304,348	60,870	60,870	60,870	60,870	60,870	
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Technology - Hard Cost				304,348	60,870	60,870	60,870	60,870	60,870	0

Technology - Soft Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Project Management			leveraging existing	0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Technology - Soft Cost				0	0	0	0	0	0	0
TOTAL TECHNOLOGY COST				304,348	60,870	60,870	60,870	60,870	60,870	0

CONTINGENCY

Contingency

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Contingency			15%	45,652	9,130	9,130	9,130	9,130	9,130	0
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Contingency				45,652	9,130	9,130	9,130	9,130	9,130	0

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City of Richmond - Smart Cities Challenge - Project Budget

1.1 Smart Streets	*3. Plan for Information Flow from Sensor Location to Central Hub*

OPERATING COST (OPERATING BUDGET IMPACT (OBI))

Operating Budget Impact (OBI)

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total	2019	2020	2021	2022	2023	2024
NA				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Operating Budget Impact (OBI)				0	0	0	0	0	0	0
TOTAL COSTS				**350,000**	**70,000**	**70,000**	**70,000**	**70,000**	**70,000**	**0**

REVENUES AND OTHER FINANCIAL INFLOWS

Financial Inflows to the Organization

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
NA				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Financial Inflows to the Organization				0	0	0	0	0	0	0
NET CASH-FLOW (Revenue - Costs)				**(350,000)**	**(70,000)**	**(70,000)**	**(70,000)**	**(70,000)**	**(70,000)**	**0**

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City of Richmond - Smart Cities Challenge - Project Budget

1.1 Smart Streets | *4. Installation of GPS Pre-emption System at Signalized Intersections*

CONSTRUCTION COST

Construction - Hard Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total	2019	2020	2021	2022	2023	2024
NA				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Construction - Hard Cost				**0**	**0**	**0**	**0**	**0**	**0**	**0**

Construction - Soft Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total	2019	2020	2021	2022	2023	2024
Project Management - Consultant				21,739	4,348	4,348	4,348	4,348	4,348	
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Construction - Soft Cost				**21,739**	**4,348**	**4,348**	**4,348**	**4,348**	**4,348**	**0**
TOTAL CONSTRUCTION COST				**21,739**	**4,348**	**4,348**	**4,348**	**4,348**	**4,348**	**0**

TECHNOLOGY COST

Technology - Hard Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total	Pilot Program of 5 Locations and 3 vehicles				
Project Management	Quotation	Vendor Quotation	20 Fire-Rescue Vehicles	99,130	14,870	21,065	21,065	21,065	21,065
Intersection Components (175 intersections)	Quotation	Vendor Quotation	175 intersections	989,130	28,261	240,217	240,217	240,217	240,217
Fire Hall Equipment (7 Fire halls and RCMP Headquarters)	Quotation	Vendor Quotation	7 Fire hall and RCMP	43,480	5,435	9,511	9,511	9,511	9,511
Vehicle Component Installation	Estimate			8,696	1,304	1,848	1,848	1,848	1,848
Fire Hall Equipment Installation (8 locations)	Electrical Contract Rates	Contract 5658P	7 Fire hall and RCMP	77,739	1,913	18,957	18,957	18,957	18,957
Intersection Component Installation	Electrical Contract Rates	Contract 5658P	175 intersections	336,522	9,565	81,739	81,739	81,739	81,739
	Quotation	Vendor		43,478	43,478				
Central Server	Quotation	Vendor	1 server at TMC	17,391	17,391				
				0					
				0					
TOTAL Technology - Hard Cost				**1,615,567**	**122,217**	**373,337**	**373,337**	**373,337**	**373,337**	**0**

Technology - Soft Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Project Management			leveraging existing	0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Technology - Soft Cost				**0**	**0**	**0**	**0**	**0**	**0**	**0**
TOTAL TECHNOLOGY COST				**1,615,567**	**122,217**	**373,337**	**373,337**	**373,337**	**373,337**	**0**

CONTINGENCY

Contingency

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total	2019	2020	2021	2022	2023	2024
Contingency			15%	245,596	18,985	56,653	56,653	56,653	56,653	0
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Contingency				**245,596**	**18,985**	**56,653**	**56,653**	**56,653**	**56,653**	**0**

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City of Richmond - Smart Cities Challenge - Project Budget

1.1 Smart Streets | *4. Installation of GPS Pre-emption System at Signalized Intersections*

OPERATING COST (OPERATING BUDGET IMPACT (OBI))

Operating Budget Impact (OBI)

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total	2019	2020	2021	2022	2023	2024
					ual Maintenance 5 loc	44 locations	44 locations	44 locations	44 locations	
System Maintenance (annual maintenance on field components)	Estimate	Estimate		165,600	3,680	32,384	32,384	32,384	32,384	32,384
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Operating Budget Impact (OBI)				165,600	3,680	32,384	32,384	32,384	32,384	32,384
TOTAL COSTS				2,048,502	149,230	466,722	466,722	466,722	466,722	32,384

REVENUES AND OTHER FINANCIAL INFLOWS

Financial Inflows to the Organization

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
NA				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Financial Inflows to the Organization				0	0	0	0	0	0	0
NET CASH-FLOW (Revenue - Costs)				(2,048,502)	(149,230)	(466,722)	(466,722)	(466,722)	(466,722)	(32,384)

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City of Richmond - Smart Cities Challenge - Project Budget

1.1 Smart Streets | *5. Additional Features in the Advanced Traffic Management System*

CONSTRUCTION COST

Construction - Hard Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total	2019	2020	2021	2022	2023	2024
Included under Project 1.1-2 construction costs				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Construction - Hard Cost				0	0	0	0	0	0	0

Construction - Soft Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
NA				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Construction - Soft Cost				0	0	0	0	0	0	0
TOTAL CONSTRUCTION COST				0	0	0	0	0	0	0

TECHNOLOGY COST

Technology - Hard Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total	25 locations/yr	25 locations/yr	25 locations/yr	25 locations/yr	25 locations/yr	
Project Management	Quotation	Vendor Quotation	100 locations	2,304,348	460,870	460,870	460,870	460,870	460,870	
Install Traffic Detection Cameras	Quotation	Contract 5658P	100 locations	565,217	113,043	113,043	113,043	113,043	113,043	
Camera Licensing Software	Quotation	Vendor Quotation		14,783	2,957	2,957	2,957	2,957	2,957	
Traffic signal timing and analysis software (add-on module)	Quotation	Vendor Quotation		26,087	26,087					
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Technology - Hard Cost				2,910,435	602,957	576,870	576,870	576,870	576,870	0

Technology - Soft Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Project Management			leveraging existing	0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Technology - Soft Cost				0	0	0	0	0	0	0
TOTAL TECHNOLOGY COST				2,910,435	602,957	576,870	576,870	576,870	576,870	0

CONTINGENCY

Contingency

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Contingency			15%	436,565	90,443	86,530	86,530	86,530	86,530	0
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Contingency				436,565	90,443	86,530	86,530	86,530	86,530	0

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City of Richmond - Smart Cities Challenge - Project Budget

1.1 Smart Streets	5. Additional Features in the Advanced Traffic Management System

OPERATING COST (OPERATING BUDGET IMPACT (OBI))

Operating Budget Impact (OBI)

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total	25 locations/yr	25 locations/yr	25 locations/yr	25 locations/yr	25 locations/yr	
				Total	2019	2020	2021	2022	2023	2024
System Maintenance (annual maintenance on field components)	Estimate	Estimate		367,500	61,250	61,250	61,250	61,250	61,250	61,250
Software Assurance and Support				210,000	35,000	35,000	35,000	35,000	35,000	35,000
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Operating Budget Impact (OBI)				577,500	96,250	96,250	96,250	96,250	96,250	96,250
TOTAL COSTS				3,924,500	789,650	759,650	759,650	759,650	759,650	96,250

REVENUES AND OTHER FINANCIAL INFLOWS

Financial Inflows to the Organization

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Near firm third-party partner contribution or grant				700,000	140,000	140,000	140,000	140,000	140,000	
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Financial Inflows to the Organization				700,000	140,000	140,000	140,000	140,000	140,000	0
NET CASH-FLOW (Revenue - Costs)				(3,224,500)	(649,650)	(619,650)	(619,650)	(619,650)	(619,650)	(96,250)

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City of Richmond - Smart Cities Challenge - Project Budget

1.1 Smart Streets | *6. Installation of UPS System at Signalized Intersections*

CONSTRUCTION COST

Construction - Hard Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total	2019 (22 locations/yr)	2020 (22 locations/yr)	2021 (22 locations/yr)	2022 (22 locations/yr)	2023 (22 locations/yr)	2024
Installation of UPS base and underground electrical components	Contractor Rates	Contract 5659 EOI		956,522	191,304	191,304	191,304	191,304	191,304	
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Construction - Hard Cost				**956,522**	**191,304**	**191,304**	**191,304**	**191,304**	**191,304**	**0**

Construction - Soft Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Project Management			leveraging existing	0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Construction - Soft Cost				**0**	**0**	**0**	**0**	**0**	**0**	**0**

TOTAL CONSTRUCTION COST				**956,522**	**191,304**	**191,304**	**191,304**	**191,304**	**191,304**	**0**

TECHNOLOGY COST

Technology - Hard Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total	2019 (22 locations/yr)	2020 (22 locations/yr)	2021 (22 locations/yr)	2022 (22 locations/yr)	2023 (22 locations/yr)	2024
Project Management	Quotation	Vendor Quotation		1,147,826	229,565	229,565	229,565	229,565	229,565	
Installation Labour	Quotation	Contract 5658P		621,739	124,348	124,348	124,348	124,348	124,348	
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Technology - Hard Cost				**1,769,565**	**353,913**	**353,913**	**353,913**	**353,913**	**353,913**	**0**

Technology - Soft Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Project Management			leveraging existing	0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Technology - Soft Cost				**0**	**0**	**0**	**0**	**0**	**0**	**0**

TOTAL TECHNOLOGY COST				**1,769,565**	**353,913**	**353,913**	**353,913**	**353,913**	**353,913**	**0**

CONTINGENCY

Contingency

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Contingency			15%	408,913	81,783	81,783	81,783	81,783	81,783	0
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Contingency				**408,913**	**81,783**	**81,783**	**81,783**	**81,783**	**81,783**	**0**

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City of Richmond - Smart Cities Challenge - Project Budget

1.1 Smart Streets | *6. Installation of UPS System at Signalized Intersections*

	Methods	Sources	Assumptions	Total	2019	2020	2021	2022	2023	2024
OPERATING COST (OPERATING BUDGET IMPACT (OBI))										
Operating Budget Impact (OBI)										
Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
System Maintenance (annual maintenance on field components)	Estimate	Estimate		115,500	19,250	19,250	19,250	19,250	19,250	19,250
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Operating Budget Impact (OBI)				**115,500**	**19,250**	**19,250**	**19,250**	**19,250**	**19,250**	**19,250**
TOTAL COSTS				**3,250,500**	**646,250**	**646,250**	**646,250**	**646,250**	**646,250**	**19,250**
REVENUES AND OTHER FINANCIAL INFLOWS										
Financial Inflows to the Organization										
Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Near firm third-party partner contribution or grant				275,000	55,000	55,000	55,000	55,000	55,000	
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Financial Inflows to the Organization				**275,000**	**55,000**	**55,000**	**55,000**	**55,000**	**55,000**	**0**
NET CASH-FLOW (Revenue - Costs)				**(2,975,500)**	**(591,250)**	**(591,250)**	**(591,250)**	**(591,250)**	**(591,250)**	**(19,250)**

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City of Richmond - Smart Cities Challenge - Project Budget

1.2 Sustainable Transportation | *1. Increase EV use and ownership*

CONSTRUCTION COST

Construction - Hard Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total	2019	2020	2021	2022	2023	2024
Property for EV Charging Stations	n/a	n/a	City Property	0						
Equipment EV Charging Stations - Level 2 Stations	Unit Cost for Level 2	Fleet services	stations at strategic	384,000		60,000	120,000	120,000	84,000	
Equipment EV Charging Stations - Level 3 Stations	Unit Cost for Level 3	Fleet services	strategic locations	960,000		120,000	300,000	300,000	240,000	
EV charging station installation labour - Level 2 stations	Best Practices	Engineering	costs	96,000		15,000	30,000	30,000	21,000	
EV charging station installation labour - Level 3 stations	Best Practices	Engineering	costs	240,000		30,000	75,000	75,000	60,000	
				0						
				0						
				0						
				0						
				0						
TOTAL Construction - Hard Cost				1,680,000	0	225,000	525,000	525,000	405,000	0

Construction - Soft Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Project Management	Best practices	Engineering	10% of Construction - Hard Cost	168,000		22,500	52,500	52,500	40,500	
Construction Management	Best practices	Engineering	5% of Construction - Hard Cost	84,000		11,250	26,250	26,250	20,250	
Consulting Services - EV Network Strategy and Implementation Plan	Other contracts for consulting services	Transportation	Based on cost for Update of City Centre Cycling Network Plan	150,000	115,000	35,000				
Stakeholder Engagement and Communication	Other contracts for consulting services	Sustainability	Comparables	55,000	15,000	10,000	10,000	10,000	10,000	
Additional Salaries - EV advisor	Comparable salaries	Sustainability	1 FTE required	426,667	80,000	80,000	80,000	80,000	80,000	26,667
Additional Salaries - Operations Clerk	Comparable salaries	Fleet	0.25 FTE required	96,000	18,000	18,000	18,000	18,000	18,000	6,000
				0						
				0						
				0						
				0						
TOTAL Construction - Soft Cost				979,667	228,000	176,750	186,750	186,750	168,750	32,667
TOTAL CONSTRUCTION COST				2,659,667	228,000	401,750	711,750	711,750	573,750	32,667

TECHNOLOGY COST

Technology - Hard Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
NA				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Technology - Hard Cost				0	0	0	0	0	0	0

Technology - Soft Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
NA				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Technology - Soft Cost				0	0	0	0	0	0	0
TOTAL TECHNOLOGY COST				0	0	0	0	0	0	0

CONTINGENCY

Contingency

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Contingency			20%	531,933	45,600	80,350	142,350	142,350	114,750	6,533
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Contingency				531,933	45,600	80,350	142,350	142,350	114,750	6,533

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City of Richmond - Smart Cities Challenge - Project Budget

1.2 Sustainable Transportation | *1. Increase EV use and ownership*

OPERATING COST (OPERATING BUDGET IMPACT (OBI))

Operating Budget Impact (OBI)

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total	2019	2020	2021	2022	2023	2024
Software - Network Management Fee	Unit Cost	Supplier	New EV stations will be managed by the City	67,427		3,600	11,400	19,200	24,920	8,307
Utilities	Unit Cost	Comparables	per each level 2 station	219,167		12,500	37,500	62,500	80,000	26,667
Utilities	Unit Cost	Comparables	per each level 3 station	169,333		8,000	28,000	48,000	64,000	21,333
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Operating Budget Impact (OBI)				455,927	0	24,100	76,900	129,700	168,920	56,307
TOTAL COSTS				3,647,527	273,600	506,200	931,000	983,800	857,420	95,507

REVENUES AND OTHER FINANCIAL INFLOWS

Financial Inflows to the Organization

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
EV parking cost recovery	Unit Revenue	Comparables	$3200 per Level 2 station	280,533		16,000	48,000	80,000	102,400	34,133
EV parking cost recovery	Unit Revenue	Comparables	$4500 per Level 3 station	190,500		9,000	31,500	54,000	72,000	24,000
Near firm third-party partner contribution or grant				416,000		56,000	130,000	130,000	100,000	
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Financial Inflows to the Organization				887,033	0	81,000	209,500	264,000	274,400	58,133
NET CASH-FLOW (Revenue - Costs)				(2,760,494)	(273,600)	(425,200)	(721,500)	(719,800)	(583,020)	(37,374)

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City of Richmond - Smart Cities Challenge - Project Budget

1.2 Sustainable Transportation | *2. Mobility Hubs*

CONSTRUCTION COST

Construction - Hard Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total	2019	2020	2021	2022	2023	2024
Property for Mobility Hub	n/a	n/a	City Property	0						
Construction: Vehicle Parking Area	Parking Space	Engineering	$8,000/space	80,000					80,000	
Equipment: EV Charging Stations			Objective 1	0						
Equipment: Transit Shelter	Unit Cost	Supplier	4 per hub	200,000					200,000	
Equipment: Automated Secure Bike Parking	Unit Cost	Supplier	1 per hub	150,000					150,000	
Amenities: Benches, Receptacles	L/S	Engineering		10,000					10,000	
Lighting	Unit Cost	Engineering	$10,000/LED ped pole	100,000					100,000	
Landscaping	L/S	Engineering	$1,000/tree	25,000					25,000	
				0						
				0						
TOTAL Construction - Hard Cost				565,000	0	0	0	0	565,000	0

Construction - Soft Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Project Management		Engineering		40,000					40,000	
Design		Engineering		120,000					120,000	
Consulting Services	consulting services	Transportation	Update of City Centre	150,000	115,000	35,000				
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Construction - Soft Cost				310,000	115,000	35,000	0	0	160,000	0
TOTAL CONSTRUCTION COST				875,000	115,000	35,000	0	0	725,000	0

TECHNOLOGY COST

Technology - Hard Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
NA				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Technology - Hard Cost				0	0	0	0	0	0	0

Technology - Soft Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
NA				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Technology - Soft Cost				0	0	0	0	0	0	0
TOTAL TECHNOLOGY COST				0	0	0	0	0	0	0

CONTINGENCY

Contingency

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Contingency			20%	175,000	23,000	7,000	0	0	145,000	0
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Contingency				175,000	23,000	7,000	0	0	145,000	0

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City of Richmond - Smart Cities Challenge - Project Budget

1.2 Sustainable Transportation	*2. Mobility Hubs*

OPERATING COST (OPERATING BUDGET IMPACT (OBI))

Operating Budget Impact (OBI)

Line Item Description [add rows in the middle]	Methods	Sources	Assumptions	Total	2019	2020	2021	2022	2023	2024
Maintenance	Unit rates	Public Works	50% of OBI for bus mall	20,000						20,000
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Operating Budget Impact (OBI)				20,000	0	0	0	0	0	20,000
TOTAL COSTS				1,070,000	138,000	42,000	0	0	870,000	20,000

REVENUES AND OTHER FINANCIAL INFLOWS

Financial Inflows to the Organization

Line Item Description [add rows in the middle]	Methods	Sources	Assumptions	Total						
NA				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Financial Inflows to the Organization				0	0	0	0	0	0	0
NET CASH-FLOW (Revenue - Costs)				(1,070,000)	(138,000)	(42,000)	0	0	(870,000)	(20,000)

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City of Richmond - Smart Cities Challenge - Project Budget

2.1	*Integrated Smart Alerts and Post Disaster Assessment*									
	Methods	Sources	Assumptions	Total	2019	2020	2021	2022	2023	2024
CONSTRUCTION COST										
Construction - Hard Cost										
Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
SCADA Materials/Equipment	Previous projects	Previous projects	Current Market	475,000	237,500	237,500				
SCADA Labor	Previous projects	Previous projects	Current Market	280,000	140,000	140,000				
District Energy Materials/Equipment	Best practice	Best practice	Current Market	1,090,000			545,000	545,000		
District Energy Labour	Best practice	Best practice	Current Market	450,000			225,000	225,000		
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Construction - Hard Cost				**2,295,000**	**377,500**	**377,500**	**770,000**	**770,000**	**0**	**0**
Construction - Soft Cost										
Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Project Management	Best Practice	Previous projects	District Energy costs	77,000	38,500	38,500				
Services / Labor / External Consultants	Best Practice	Previous projects	District Energy costs	77,000	38,500	38,500				
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Construction - Soft Cost				**154,000**	**77,000**	**77,000**	**0**	**0**	**0**	**0**
TOTAL CONSTRUCTION COST				**2,449,000**	**454,500**	**454,500**	**770,000**	**770,000**	**0**	**0**
TECHNOLOGY COST										
Technology - Hard Cost										
Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Project Management	Previous Projects	Previous Projects	Utilizing city standards	80,000	40,000	40,000				
Drones	Best Practice	Consultants	Certifications and piloting requirements suitable for deployment	150,000	75,000	75,000				
SCADA Hardware Replacement	Previous Projects	Previous Projects	20% of SCADA Inventory, 0 for District Energy upgrades	190,000	95,000	95,000				
SCADA Software upgrades in multiple systems (Operational)	Previous projects	Previous Projects	Utilizing city standards	0						
Drone software and development	Best Practice	Consultants	piloting requirements	200,000	100,000	100,000				
myRichmond	Best Practice	Consultants	Included in 3.1	0						
	Best Practice	Consultants	connectivity to sensors	16,000	16,000					
Develop an integrated smart alert system (integration with ENS)	Best Practice	Consultants	Included in 3.1	0						
Develop an integrated smart alert system (integration with EMIS)	Best Practice	Consultants		60,000		60,000				
				0						
TOTAL Technology - Hard Cost				**696,000**	**326,000**	**370,000**	**0**	**0**	**0**	**0**
Technology - Soft Cost										
Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Project Management			leveraging existing	0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Technology - Soft Cost				**0**	**0**	**0**	**0**	**0**	**0**	**0**
TOTAL TECHNOLOGY COST				**696,000**	**326,000**	**370,000**	**0**	**0**	**0**	**0**

Processed under the provisions of the Access to Information Act /Révisé en vertu de la Loi sur l'accès à l'information

City of Richmond - Smart Cities Challenge - Project Budget

2.1	*Integrated Smart Alerts and Post Disaster Assessment*									
	Methods	Sources	Assumptions	Total	2019	2020	2021	2022	2023	2024
CONTINGENCY										
Contingency										
Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Contingency			20%	629,000	156,100	164,900	154,000	154,000	0	0
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Contingency				629,000	156,100	164,900	154,000	154,000	0	0
OPERATING COST (OPERATING BUDGET IMPACT (OBI))										
Operating Budget Impact (OBI)										
Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
SCADA Software Annual Licensing Fees	Previous Projects	Previous Projects	15% of software cost	58,500	9,750	9,750	9,750	9,750	9,750	9,750
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Operating Budget Impact (OBI)				58,500	9,750	9,750	9,750	9,750	9,750	9,750
TOTAL COSTS				3,832,500	946,350	999,150	933,750	933,750	9,750	9,750
REVENUES AND OTHER FINANCIAL INFLOWS										
Financial Inflows to the Organization										
Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
NA				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Financial Inflows to the Organization				0	0	0	0	0	0	0
NET CASH-FLOW (Revenue - Costs)				(3,832,500)	(946,350)	(999,150)	(933,750)	(933,750)	(9,750)	(9,750)

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City of Richmond - Smart Cities Challenge - Project Budget

2.2	*Resilient Energy Source for Emergency Assets*

CONSTRUCTION COST

Construction - Hard Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total	2019	2020	2021	2022	2023	2024
Water PRV station – turbine generator (installed) 13 locations		Existing projects	Based on similar projects	1,300,000		260,000	260,000	260,000	260,000	260,000
system (8 locations)		Based on study		1,600,000		320,000	320,000	320,000	320,000	320,000
less energy source (3 locations)		Existing projects	projects	60,000		20,000	20,000	20,000		
locations)		Existing projects	projects	1,050,000		210,000	210,000	210,000	210,000	210,000
less generator (18 locations)		Existing projects	projects	360,000		72,000	72,000	72,000	72,000	72,000
Buildings (generator install) (9 locations)		Existing projects	projects	2,700,000		540,000	540,000	540,000	540,000	540,000
locations)	installation for backup	group	boards	960,000		192,000	192,000	192,000	192,000	192,000
Streetlight backup power (approx 15 locations)	location		backup power for street	750,000		150,000	150,000	150,000	150,000	150,000
				0						
				0						
TOTAL Construction - Hard Cost				8,780,000	0	1,764,000	1,764,000	1,764,000	1,744,000	1,744,000

Construction - Soft Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Engineering Design consultant services (preliminary design, detailed design, tendering)		Based on similar projects	approx 10% of Construction - Hard Cost	878,000		176,400	176,400	176,400	174,400	174,400
Engineering Design consultant services (construction inspection, contract administration, construction management)		Based on similar projects	approx 5% of Construction - Hard Cost	439,000		88,200	88,200	88,200	87,200	87,200
Project Management			No additional cost - leveraging existing resources	0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Construction - Soft Cost				1,317,000	0	264,600	264,600	264,600	261,600	261,600
TOTAL CONSTRUCTION COST				10,097,000	0	2,028,600	2,028,600	2,028,600	2,005,600	2,005,600

TECHNOLOGY COST

Technology - Hard Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
NA				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Technology - Hard Cost				0	0	0	0	0	0	0

Technology - Soft Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
NA				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Technology - Soft Cost				0	0	0	0	0	0	0
TOTAL TECHNOLOGY COST				0	0	0	0	0	0	0

CONTINGENCY

Contingency

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Contingency			20%	2,019,400	0	405,720	405,720	405,720	401,120	401,120
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Contingency				2,019,400	0	405,720	405,720	405,720	401,120	401,120

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City of Richmond - Smart Cities Challenge - Project Budget

2.2	*Resilient Energy Source for Emergency Assets*

OPERATING COST (OPERATING BUDGET IMPACT (OBI))

Operating Budget Impact (OBI)

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total	2019	2020	2021	2022	2023	2024
Water PRV station – turbine generator (installed) 13 locations			$5,000 /yr for each of 13 locations	65,000						65,000
Sanitary Pump Stations – Full 'smart upgrade' c/w battery energy system (8 locations)			$5,000 /yr for each of 8 locations	40,000						40,000
Sanitary Pump Stations w/ existing generators– full 'smart upgrade' less energy source (3 locations)			No OBI as generator already exists	0						
Drainage Pump Stations – full 'smart upgrade' c/w generator (7 locations)			$10,000/ yr for each of 7 locations	70,000						70,000
Drainage Pump Stations w/ existing generator– full 'smart upgrade' less generator (18 locations)			No OBI as generator already exists	0						
Buildings (generator install) (9 locations)			$10,000/ yr for each of 9 locations	90,000						90,000
Digital sign at bus shelters - battery energy system (approx. 96 locations)			$500 /yr for each of 96 locations	48,000						48,000
Streetlight backup power (approx 15 locations)			$5,000 /yr for each of 15 locations	75,000						75,000
				0						
				0						
TOTAL Operating Budget Impact (OBI)				**388,000**	**0**	**0**	**0**	**0**	**0**	**388,000**
TOTAL COSTS				**12,504,400**	**0**	**2,434,320**	**2,434,320**	**2,434,320**	**2,406,720**	**2,794,720**

REVENUES AND OTHER FINANCIAL INFLOWS

Financial Inflows to the Organization

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
NA				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Financial Inflows to the Organization				**0**	**0**	**0**	**0**	**0**	**0**	**0**
NET CASH-FLOW (Revenue - Costs)				**(12,504,400)**	**0**	**(2,434,320)**	**(2,434,320)**	**(2,434,320)**	**(2,406,720)**	**(2,794,720)**

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City of Richmond - Smart Cities Challenge - Project Budget

2.3	*Integrated Municipal Operations Hub*

CONSTRUCTION COST

Construction - Hard Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total	2019	2020	2021	2022	2023	2024
Design and Construction of Existing Firehall #1 - 3S Standard Stations	Quotation	Vendor		10,000,000	500,000	1,500,000	3,000,000	4,500,000	500,000	
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Construction - Hard Cost				**10,000,000**	**500,000**	**1,500,000**	**3,000,000**	**4,500,000**	**500,000**	**0**

Construction - Soft Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Project Management			Hard Cost	1,000,000	200,000	200,000	200,000	200,000	200,000	
Zoning and Permitting				100,000	50,000	50,000				
Insurance, Admin, Bonds				400,000	80,000	80,000	80,000	80,000	80,000	
Post Construction Occupancy				200,000				100,000	100,000	
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Construction - Soft Cost				**1,700,000**	**330,000**	**330,000**	**280,000**	**380,000**	**380,000**	**0**
TOTAL CONSTRUCTION COST				**11,700,000**	**830,000**	**1,830,000**	**3,280,000**	**4,880,000**	**880,000**	**0**

TECHNOLOGY COST

Technology - Hard Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Services	Quotation	Vendor	CPU-based licenses based on requirements of fault-tolerant and highly available services. Named licenses based on 75 power users and 5 analysts for real-time analytics. Non-enterprise versions of Open Source software assumed for Big Data (Hadoop, Spark).	3,990,000	1,995,000	997,500	997,500			
Hardware - compute	Similar quotation	Vendor	5 compute nodes, includes installation service and hardware license	400,000	200,000	200,000				
Hardware - storage (200TB SAS, 50TB SSD)	Quotation	Vendor	200TB SAS for Sensor non-RAID (Big Data use-case), 50TB SSD PureStorage for Analytics (DB use-case)	559,000	239,000	320,000				
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Technology - Hard Cost				**4,949,000**	**2,434,000**	**1,517,500**	**997,500**	**0**	**0**	**0**

Technology - Soft Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Services	Quotation	Vendor	processing, GIS,	4,815,680	800,000	2,000,000	2,015,680			
Project Management			leveraging existing	0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Technology - Soft Cost				**4,815,680**	**800,000**	**2,000,000**	**2,015,680**	**0**	**0**	**0**
TOTAL TECHNOLOGY COST				**9,764,680**	**3,234,000**	**3,517,500**	**3,013,180**	**0**	**0**	**0**

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City of Richmond - Smart Cities Challenge - Project Budget

2.3	*Integrated Municipal Operations Hub*

CONTINGENCY

Contingency

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total	2019	2020	2021	2022	2023	2024
Contingency			20%	4,292,936	812,800	1,069,500	1,258,636	976,000	176,000	0
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Contingency				4,292,936	812,800	1,069,500	1,258,636	976,000	176,000	0

OPERATING COST (OPERATING BUDGET IMPACT (OBI))

Operating Budget Impact (OBI)

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Annual licensing fees	Experience		20% of initial license cost	3,591,000		399,000	798,000	798,000	798,000	798,000
ML Model management & maintenance	Similar quote	Vendor	Tuning of model. Not meant for parameters change, sensor upgrades, and underlying ML assumption changes	9,200					4,600	4,600
ML Model retraining	Similar quote	Vendor	Tuning of model. Not meant for parameters change, sensor upgrades, and underlying ML assumption changes	9,200					4,600	4,600
Infrastructure Evergreen	Depreciation 5 yrs			0						
				0						
				0						
				0						
				0						
				0						
TOTAL Operating Budget Impact (OBI)				3,609,400	0	399,000	798,000	798,000	807,200	807,200
TOTAL COSTS				29,367,016	4,876,800	6,816,000	8,349,816	6,654,000	1,863,200	807,200

REVENUES AND OTHER FINANCIAL INFLOWS

Financial Inflows to the Organization

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
NA				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Financial Inflows to the Organization				0	0	0	0	0	0	0
NET CASH-FLOW (Revenue - Costs)				(29,367,016)	(4,876,800)	(6,816,000)	(8,349,816)	(6,654,000)	(1,863,200)	(807,200)

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City of Richmond - Smart Cities Challenge - Project Budget

3.1	MyRichmond

CONSTRUCTION COST

Construction - Hard Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total	2019	2020	2021	2022	2023	2024
NA				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Construction - Hard Cost				0	0	0	0	0	0	0

Construction - Soft Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
NA				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Construction - Soft Cost				0	0	0	0	0	0	0
TOTAL CONSTRUCTION COST				0	0	0	0	0	0	0

TECHNOLOGY COST

Technology - Hard Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Project Management		Consultants	All items are for web and mobile, and all LOB systems have documentation available. DNE Hardware and Licensing costs are excluded.	375,000	300,000	75,000				
Services (Obj.2)		Consultants / Staff	All items are for web and mobile, and all LOB systems have documentation available. Apart from 2019 it is assumed that mobile costs are within the individual objectives.	600,000	600,000					
Services (Obj. 3 & 4)		Consultants	All items are for web and mobile, and all LOB systems have documentation available. DNE Hardware and Licensing costs are excluded.	20,000		20,000				
Services (Obj. 5)		Consultants	and mobile, and all LOB	375,000	300,000	50,000	25,000			
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Technology - Hard Cost				1,370,000	1,200,000	145,000	25,000	0	0	0

Technology - Soft Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Project Management			PM function	17,000	3,400	3,400	3,400	3,400	3,400	
Marketing			$25k per year	125,000	25,000	25,000	25,000	25,000	25,000	
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Technology - Soft Cost				142,000	28,400	28,400	28,400	28,400	28,400	0
TOTAL TECHNOLOGY COST				1,512,000	1,228,400	173,400	53,400	28,400	28,400	0

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City of Richmond - Smart Cities Challenge - Project Budget

3.1	MyRichmond

CONTINGENCY

Contingency

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total	2019	2020	2021	2022	2023	2024
Contingency			20%	302,400	245,680	34,680	10,680	5,680	5,680	0
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Contingency				302,400	245,680	34,680	10,680	5,680	5,680	0

OPERATING COST (OPERATING BUDGET IMPACT (OBI))

Operating Budget Impact (OBI)

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
NA				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Operating Budget Impact (OBI)				0	0	0	0	0	0	0
TOTAL COSTS				1,814,400	1,474,080	208,080	64,080	34,080	34,080	0

REVENUES AND OTHER FINANCIAL INFLOWS

Financial Inflows to the Organization

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
NA				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Financial Inflows to the Organization				0	0	0	0	0	0	0
NET CASH-FLOW (Revenue - Costs)				(1,814,400)	(1,474,080)	(208,080)	(64,080)	(34,080)	(34,080)	0

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City of Richmond - Smart Cities Challenge - Project Budget

3.2	*Integrated Communication Tools*

CONSTRUCTION COST

Construction - Hard Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total	2019	2020	2021	2022	2023	2024
NA				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Construction - Hard Cost				0	0	0	0	0	0	0

Construction - Soft Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
NA				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Construction - Soft Cost				0	0	0	0	0	0	0
TOTAL CONSTRUCTION COST				0	0	0	0	0	0	0

TECHNOLOGY COST

Technology - Hard Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Project Management	Past experience and comparison to similar projects	Staff	All items are for web and mobile. LOB systems have documentation available.	196,413	53,400	106,800	36,213			
Obj. 2.1 - Integrate multilingual communications tools on City information platforms	Past experience	Staff	All items are for web and mobile. LOB systems have documentation available.	93,450		18,690	28,035	28,035	18,690	
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Technology - Hard Cost				289,863	53,400	125,490	64,248	28,035	18,690	0

Technology - Soft Cost

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Project Management			leveraging existing	0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Technology - Soft Cost				0	0	0	0	0	0	0
TOTAL TECHNOLOGY COST				289,863	53,400	125,490	64,248	28,035	18,690	0

CONTINGENCY

Contingency

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Contingency			20%	57,973	10,680	25,098	12,850	5,607	3,738	0
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Contingency				57,973	10,680	25,098	12,850	5,607	3,738	0

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City of Richmond - Smart Cities Challenge - Project Budget

3.2	*Integrated Communication Tools*

OPERATING COST (OPERATING BUDGET IMPACT (OBI))

Operating Budget Impact (OBI)

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total	2019	2020	2021	2022	2023	2024
Obj. 1.1 - Social media cloud service	Analogous	Staff	Monthly charge	11,491	1,201	2,058	2,058	2,058	2,058	2,058
Obj. 2.1 - Integrate multilingual communications tools on City information platforms (Cloud translation service fee)	Analogous	Staff	Translating 100 million characters	22,000	2,000	4,000	4,000	4,000	4,000	4,000
Obj. 2.1 - Integrate multilingual communications tools on City information platforms (**1.0** FTE Multilingual Communications Specialist)	Analogous	Staff	Pay at a Manager equivalent rate with language and communication skills.	670,000	70,000	120,000	120,000	120,000	120,000	120,000
Obj. 2.1 - Integrate multilingual communications tools on City information platforms (Call Center translation costs)	Used info from City of Van.	Staff	Using $2.50/minute at 700 minutes per month.	117,250	12,250	21,000	21,000	21,000	21,000	21,000
Obj. 2.2 - Develop emergency preparedness strategies to ensure accessible communication for people with disabilities or others who may be isolated from general community due to economic, health or other conditions **(1.0 FTE)**	Analogous	Staff	Youth outreach worker at J10 salary, step 1 and includes fringe at 27%	415,958	43,458	74,500	74,500	74,500	74,500	74,500
				0						
				0						
				0						
				0						
				0						
TOTAL Operating Budget Impact (OBI)				**1,236,699**	**128,909**	**221,558**	**221,558**	**221,558**	**221,558**	**221,558**
TOTAL COSTS				**1,584,535**	**192,989**	**372,146**	**298,656**	**255,200**	**243,986**	**221,558**

REVENUES AND OTHER FINANCIAL INFLOWS

Financial Inflows to the Organization

Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
NA				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Financial Inflows to the Organization				**0**	**0**	**0**	**0**	**0**	**0**	**0**
NET CASH-FLOW (Revenue - Costs)				**(1,584,535)**	**(192,989)**	**(372,146)**	**(298,656)**	**(255,200)**	**(243,986)**	**(221,558)**

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City of Richmond - Smart Cities Challenge - Project Budget

3.3	Smart Way-Finding Solutions									
	Methods	Sources	Assumptions	Total	2019	2020	2021	2022	2023	2024
CONSTRUCTION COST										
Construction - Hard Cost										
Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Construction Costs	Expert	Previous projects	Current Market	1,060,000	25,000	301,000	351,500	195,000	187,500	
Design Costs	Top Down	Previous projects	Current Tech	35,000	5,000	5,000	10,000	10,000	5,000	
Materials	Top Down	Previous projects	Current Market	2,895,000	50,000	382,200	448,300	883,000	1,131,500	
Labor	Top Down	Previous projects	Current Market	176,250	14,700	22,050	24,500	57,500	57,500	
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Construction - Hard Cost				**4,166,250**	**94,700**	**710,250**	**834,300**	**1,145,500**	**1,381,500**	**0**
Construction - Soft Cost										
Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Services	Top Down	Previous projects	Current Market	191,350	12,250	19,600	24,500	77,500	57,500	
Construction Management	Comparative	Previous Projects	Current Market	337,172	6,289	17,791	23,653	130,560	158,880	
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Construction - Soft Cost				**528,522**	**18,539**	**37,391**	**48,153**	**208,060**	**216,380**	**0**
TOTAL CONSTRUCTION COST				**4,694,772**	**113,239**	**747,641**	**882,453**	**1,353,560**	**1,597,880**	**0**
TECHNOLOGY COST										
Technology - Hard Cost										
Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Project Management	Top Down	Previous Projects	Resource Availability	150,000	100,000	50,000				
Software - API Setup & Management	Comparative	CoV/UBC	Project Scope	13,000		13,000				
Software - GIS/RIM Enhancements	Top Down	Previous Projects	Resource Availability	150,000	90,000	60,000				
Software - Wayfinding solution	Top Down	US DOT ATTRI	Project Scope	150,000	50,000	100,000				
Software - Signage Management	Top Down	Market Research	Project Scope	100,000	25,000	75,000				
Software - Map publication	Comparative	CoV/UBC	Project Scope	20,000		20,000				
	Top Down	Industry	Platform	75,000	75,000					
DNE - Data Collection	Top Down	Industry	Platform	50,000	50,000					
DNE - Notifications	Top Down	Industry	Platform	50,000	50,000					
				0						
TOTAL Technology - Hard Cost				**758,000**	**440,000**	**318,000**	**0**	**0**	**0**	**0**
Technology - Soft Cost										
Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Project Management	Comparative	Previous Projects	Cost	37,900	22,000	15,900				
Asset Collection/Modelling	Comparative	Previous Projects	GIS/RIM specific	150,000			50,000	100,000		
Marketing	Comparative	Previous Projects	Materials	100,000	10,000	20,000	20,000	20,000	30,000	
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Technology - Soft Cost				**287,900**	**32,000**	**35,900**	**70,000**	**120,000**	**30,000**	**0**
TOTAL TECHNOLOGY COST				**1,045,900**	**472,000**	**353,900**	**70,000**	**120,000**	**30,000**	**0**
CONTINGENCY										
Contingency										
Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Contingency			15%	861,101	87,786	165,231	142,868	221,034	244,182	0
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Contingency				**861,101**	**87,786**	**165,231**	**142,868**	**221,034**	**244,182**	**0**

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City of Richmond - Smart Cities Challenge - Project Budget

3.3	*Smart Way-Finding Solutions*

	Methods	Sources	Assumptions	Total	2019	2020	2021	2022	2023	2024
OPERATING COST (OPERATING BUDGET IMPACT (OBI))										
Operating Budget Impact (OBI)										
Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Annual licensing fees/Maintenance	Comparative	Industry	Standard fees	260,000		52,000	52,000	52,000	52,000	52,000
Hosting Services	Comparative	Industry	Standard fees	100,000		20,000	20,000	20,000	20,000	20,000
				0						
				0						
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Operating Budget Impact (OBI)				**360,000**	**0**	**72,000**	**72,000**	**72,000**	**72,000**	**72,000**
TOTAL COSTS				**6,961,773**	**673,024**	**1,338,772**	**1,167,321**	**1,766,594**	**1,944,062**	**72,000**
REVENUES AND OTHER FINANCIAL INFLOWS										
Financial Inflows to the Organization										
Line Item Description (add rows in the middle)	Methods	Sources	Assumptions	Total						
Near firm third-party partner contribution or grant				3,250,000	224,500	537,000	609,500	847,000	1,032,000	
Operating Savings	Top Down	Previous Projects	Current Rates	485,000		75,000	130,000	130,000	150,000	
Work Space Savings	Top Down	Previous Projects	Current Rates	280,000		30,000	50,000	100,000	100,000	
Productivity	Top Down	Previous Projects	Current Rates	660,000		150,000	170,000	170,000	170,000	
				0						
				0						
				0						
				0						
				0						
				0						
TOTAL Financial Inflows to the Organization				**4,675,000**	**224,500**	**792,000**	**959,500**	**1,247,000**	**1,452,000**	**0**
NET CASH-FLOW (Revenue - Costs)				**(2,286,773)**	**(448,525)**	**(546,772)**	**(207,821)**	**(519,594)**	**(492,062)**	**(72,000)**

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Projects that may Qualifying for Additional Senior Government Funding Programs

1.1 Smart Streets

Objective: Create Smart Streets through connected sensors

1. Install smart street lights at major intersections with LED motion sensitive lighting, high definition motion sensors, surveillance cameras, sound sensors, motion sensors, and Wi-Fi;
2. Install fibre optics and deploy CCTV at high risk intersections along with other IoT sensors; and
3. Develop a plan for information flow from sensor locations to central Hub.

1.2 Sustainable Transportation

Objective: Prepare for Sustainable and Future Technology

1. Increase infrastructure required to charge electric vehicles including quick charge for buses;
2. Install technology for all road users including autonomous vehicles and virtual docking e-bikes; and
3. Develop software to link assets to central Hub.

2.1Integrated Smart Alerts and Post Disaster Assessment

Objective: Detect Emergency Incidents and Assess Damage

1. To install
    a. Utility based sensors:
        i. City wide sensors to monitor water pressure, water quality, sanitary sewer water levels, drainage system water levels, air quality, and rain sensors.
        ii. Sensors will provide day to day information on system operation and capacity as well as post disaster assessment of municipal utilities and water levels.
    b. Air quality sensors;
    c. Seismic sensors
        i. Seismic sensors on municipal facilities combined with initial structural assessment that will facilitate rapid post seismic assessment of these facilities.
2. Drone based LiDAR technology for regular dike assessment and inspection as well as post disaster dike and initial building assessment.

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Projects that may Qualifying for Additional Senior Government Funding Programs

2.2 Resilient Energy Source for Emergency Assets

Objective 3: Equip infrastructure with resilient power to function for at least 72 hours when the central electrical grid is compromised.

1. Install a sustainable power source for the Integrated Municipal Operations Hub, Emergency Operation Centre(s), Emergency Reception Centres and other vital post disaster infrastructure;
2. Ensure way-finding infrastructure such as highways signage and digital bus shelter advertising boards can operate without electricity for 72 hours;
3. Extend the use of street lights during power outages through the installation of interrupter power source generators to operate 72 hours post disaster
4. Integrate sub-metering to promote and measure efficiencies; and
5. Create integrated energy dashboards for virtual use and connect to the central Hub.

3.3 Smart Way-Finding Solutions

Objective 4: Develop way-finding solutions for everyday and emergency situations use

1. Create and implement a way-finding strategy to include highway signage and digital bus shelters advertising boards;
2. Create Smart Bus Stops which in normal times provide real-time information about roads, points of interest, next bus arrival times, airport arrival times, Wi-Fi access, electric bike charging stations and USB rapid charging. In emergencies, they have potential to become neighbourhood information billboards for emergency information;
3. Work with network carriers to access smart phones in a particular location for emergency notification. Improve emergency communication by implementing an emergency connection to residents and businesses with real time emergency notifications and update information including emergency reception centre locations; and
4. Use digital advertising boards in bus shelters, and other key messaging locations, to share emergency information including traffic rerouting at a tunnel or bridge and integrate renewable energy source for up to 72 hours.

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City of Richmond
Smart Cities Video Transcript

Voiceover:
Richmond, British Columbia.

We are the fourth-largest city in BC, and are growing every day.

Video on screen:
Scenes of Richmond: River view of mountain; competitive rower on river; overview of rows of booths at Richmond Night Market.

Voiceover:
Our economy is booming, across virtually every sector.

Video on screen:
Scenes of Canada Line rapid transit train in station and in transit; boardwalk and public art at Richmond Olympic Oval; passengers on board whale watching zodiac travelling rapidly through waves on Georgia Strait; planes at Vancouver International Airport; scenes of fruit bushes, wine store displays and wine bottling activity at Lulu Island Winery

Voiceover:
Our population is diverse, young and educated.

Video on screen:
Scenes of monks worshipping, bowing beating drum and snapping fingers at Buddhist temple, young women waiting to serve customers at farmer's market booth, close-up views of young business woman smiling taxiing ; photo of City Information Technology staff seated at meeting table

Voiceover:
We are a multi-modal international transportation hub that puts the world on our doorstep.

Video on screen:

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Scenes of man pushing open airport hangar door being opened, overview of Vancouver International Airport with planes parked on tarmac, Air Canada jet taxiing and taking off at airport, Canada Line train crossing Fraser River bridge, deep sea freighter at anchor

Voiceover:
And through all our growth, we have protected the natural heritage that surrounds us on all sides.

Video on screen:
Scenes of mature female artist outside on waterfront looking at her landscape painting, view of Minoru Park lakes, man performing tai chi in park, long view of historic wood shipyard buildings amid riverfront marshland at Britannia Shipyards National Historic Site , bicyclists riding along waterfront trail on dike

Voiceover:
But as an island city, dependent on bridges and dikes, we are particularly exposed to potentially significant emergency events.

Video on screen:
Scenes of aerial view of Port of Vancouver's Richmond container facility; streams of car and truck traffic emerging from George Massey tunnel; flowing water being released from drainage channels at waterfront pump station; firefighters standing amid flames; fire truck leaving fire hall; fire fighters smashing car window; fire fighters treating patient on a stretcher

Voiceover:
That's why we've created an innovative plan to minimize community impacts from major disasters, while also enhancing our quality of life in day-to-day activities.

Video on screen:
Scene of Richmond Smart Cities Challenge project binder being opened; young female staff member standing and looking at maps and chart in traffic management centre, emergency response staff, including fire, ambulance, police and military personnel at work in Emergency Operations Centre;

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flashing light on fire truck; man polishing bowling ball; close-ups of two young children's faces; group of young martial artist performing kicks at Richmond Olympic Oval; volleyball player leaping and hitting ball at Richmond Olympic Oval.

Voiceover:
This is the City of Richmond's solution to the Smart Cities Challenge.

Video on screen:
Scene of City Information Technology staff looking at information dashboards on big screen television, City worker in hard hat and safety vest smoothing out wet cement in construction forms at pump station; cars arriving at Vancouver International Airport terminal.

Voiceover:
I think what excites me most about the Smart Cities project is that it's an opportunity to use some cutting-edge technology to help make Richmond more resilient, and this can be something that we can showcase and use some of the lessons learned towards other cities in the province to make other cities resilient, like Richmond is trying to do.

Video on screen:
Jesal Shah of Emergency Management BC talking about Richmond's Smart Cities Challenge proposal.

Graphic text on screen:
Jesal Shah,
Director, Flood Protection Program
Emergency Management BC (EMBC), Province of BC

Voiceover:
Incompatible communication systems are a major challenge for emergency responders. With integrated communications and data sharing, we can reach across jurisdictions to provide seamless and faster response to incidents as small as traffic delays due to a sudden rain storm, to major events like an earthquake.

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Video on screen:
View of emergency response staff, including fire, ambulance and military and City personnel working in Emergency Operations Centre looking at maps and other documents; female emergency response staff member seated and speaking into radio microphone; computer server with multiple cords plugged into it; bank of computer server; animated street map of City of Richmond displayed on big screen television; fire fighter sliding down fire hall pole; fire fighters looking at street map of Richmond on big screen television while putting on safety gear; fire fighters getting into fire truck and leaving fire hall, nighttime traffic on City streets during rain storm; fire fighters in fire truck driving to call.

Voiceover:
At the heart of our plan is the Intelligent Operations Hub, a physical and virtual information portal that lets us share data and resources across the City and our partner agencies.

Video on screen:
Scenes of computer server with multiple cords connected to it; City worker in hard hat and safety vest at pump station on waterfront checking water level readings on electronic tablet; dispatcher sitting at desk at City operations yard looking at computer screens, while fire truck drives by outside; City staff working on telecommunications control panel; staff and public at information counter at Vancouver International Airport terminal.

Voiceover:

The Intelligent Operations Hub will allow us to better understand what is happening in our city in real time. Improved communication and data sharing will drive all of our decision making.

Video of screen
View of computer screen with text below appearing line by line:

Real-time incident notifications

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Faster response times

Safer streets

Greater community resiliency

Early incident detection

Improved communication

Improved way-finding

Expanded on-demand e-services

Voiceover:
It's all based on a four-stage process: Collect, Connect, Crunch and Communicate.

Video on screen:
Graphic slide with federal Smart Cities Challenge logo. Text words below appear in sequence:
Collect
Connect
Crunch
Communicate

Video on screen:
Graphic slide with words below:
COLLECT
Integrated network
Smart Sensors
Cameras
Databases

Voiceover:
First, we collect critical information from our integrated network of smart sensors, cameras, databases and other systems across the City and region.

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Video on screen:
Graphic slide with words below:
COLLECT
Integrated network
Smart Sensors
Cameras
Databases

Voiceover:
Then, we connect the data from these sources through a secure, fibre-optic network to our Intelligent Operations Hub.

Video on screen:
Graphic slide with words below:
CONNECT
Secure fibre-optic network
Intelligent operations hub

Voiceover:
We then quickly crunch the data into concise, easy-to-use actions that can be shared with all City and stakeholder operations, allowing all partners to make timely, effective decisions.

Video on screen:
Graphic slide with words below:
CRUNCH
Compile data
Easy-to-use actions
Timely, effective decisions

Voiceover:
And finally, we communicate with the public and all our stakeholders across multiple language and media platforms.

Video on screen:
Graphic slide with words below:

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COMMUNICATE
Public and stakeholders
Multiple platforms
Multiple languages

By doing this we will create 'emergency solutions for everyday challenges'.

Video on screen:
Graphic slide with words below:
Emergency solutions for everyday challenges
Voiceover:
The results will be transformative and ground-breaking, It will make Richmond more resilient, while providing tangible, practical benefits to our residents every day.

Video on screen:
Woman sitting on spar at front of sail boat on river with open arms, jet taking off from airport at sunrise, City worker standing inside pump station with all glass walls; view of digital calendar screen at City Hall meeting room; young man sitting against large tree outside looking at electronic tablet.

Voiceover:
A smart city is one where everyone has access to critical information.
Our plan lets us reach people wherever they are. Anytime. In their own language.

Video on screen:
City worker in hard hat and safety vest on dike, looking at electronic tablet, close up of hand holding smart phone with screen displaying Canadian Red Cross information, close up of hand holding smartphone and scrolling through City of Richmond information, shadow of woman walking across City Hall plaza, nighttime view of full moon, partially obscured by clouds rising over Richmond home with lit bay window, close up of hand entering Chinese character on smart phone screen.

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Voiceover:
Smart City is one I think, anticipates, practices and invests in infrastructure and technology to improve the daily lives essentially of the residents of the municipality.

Video on screen:
Tom Corsie of Vancouver Fraser Port Authority talking about Smart Cities.

Graphic text on screen:
Tom Corsie,
Vice President, Real Estate
Vancouver Fraser Port Authority

While speaker is still talking video cuts away to scenes of man walking through door of Port of Vancouver Emergency Operations Centre; view of banks of tv screens in Port's Emergency Operations Centre, Port staff member sitting at workstation in Emergency Operations Centre and talking on phone; view of map of Fraser River and port operations in east Richmond.
Voiceover:

Voiceover:
Our plan was created by engaging our entire community, through public open houses and stakeholder meetings, business engagement, online surveys, social media and community events. Our project advisory committee of thought leaders, both local and global, bring fresh thinking and best practices from the technology, government, academia, and First Nations.

Video on screen:
Scenes of Smart Cities display board at open house; group of residents looking at open house display boards; close ups display banners at Richmond Smart Cities Ideas Fair; close-up of welcome sign at Richmond Smart Cities Ideas Fair with attendees streaming by in fast motion; mix of shots of residents participating in public open house and members of Richmond Smart Cities Advisory Committee seated at boardroom table and in discussion;.

Voiceover:

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MDA has deep roots in Richmond, and we're delighted to be part of the Smart Cities Challenge with the City of Richmond. We're excited about the opportunity to use our world-leading technology to improve the quality of life and emergency resiliency right here at home.

Video on screen
Terry Tarle of MDA talking about his company's participation in Richmond Smart Cities Challenge proposal.

Graphic text on screen:
Terry Tarle
Senior Director, Enterprise Geospatial Solutions
MDA Systems Ltd.

Voiceover:
Richmond has a reputation for excellence and innovation, and a track record of honouring the commitments we make, like delivering the premiere venue and legacy facility of the 2010 Olympic Games: the Richmond Olympic Oval. Our commitment to continuous improvement is reflected in our Smart Cities proposal.

Video on screen:
Scenes of metal speed skater statue at Richmond Olympic Oval; close of young girl wearing skating helmet; City staffer standing and writing on flipchart; group of Mounties in red serge marching in Richmond Olympic Oval; views of Richmond Olympic Oval wood roof and exterior shot of Richmond Olympic Oval with Olympic rings on side of building; woman and man walking dog on plaza outside of Richmond Olympic Oval; young girl climbing on rock on plaza outside of Richmond Olympic Oval; speed skater coasting on ice at Richmond Olympic Oval.

Voiceover:
Our Smart Cities proposal would make our community more resilient and improve quality of life for all our residents.

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Our proposal will build upon Richmond's recognized best practises leadership in flood prevention, emergency response and sustainability and our award-winning Digital Strategy. We have created a plan that can be a model for all local governments across Canada seeking to adopt Smart Cities thinking.

Video on Screen:
Richmond Mayor Malcolm Brodie speaking about the City's Smart Cities Challenge proposal.

Graphic text on screen:
Mayor Malcolm Brodie
City of Richmond, BC

Video on screen:
While Mayor is talking cut away to scene of City Information Technology staff meeting around boardroom table and looking at display on big screen; City staff member in traffic management centre seated at work station and looking at computer screens; fire fighters discussing information seen on television screen ; Logistics staff seated at table in Emergency Operations Centre; fast motion scene of passengers walking through terminal at Vancouver International Airport; people walking on street after exiting Canada Line Brighouse station; close up of City worker in hard hat, smiling and nodding to camera.

This is the future we see for ourselves---a dynamic, informed community, made more resilient by using digital technology to bring the best of our City's resources together.

It's a future that begins today, by turning our Smart Cities Challenge proposal into a reality, and transforming Canada's most livable city into Canada's smartest one.

Video on screen:
View of Canada Line train arriving at station; view of Canada Line guideway from train travelling along track; City worker in hard hat, standing and talking on telephone underneath overhead metal deck at pump ; City's Emergency

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Programs Manger, standing next to large television screen and scrolling through emergency information; close up of hand holding smart phone displaying emergency information; City staffer standing inside pump station and entering commands into control pad; water draining into storm sewer; fire truck parked in fire hall bay; group of City staff gathering together on City Hall plaza; aerial view of Vancouver International Airport terminal and parking lots; view of jet plane taking off over retail outlet mall at airport; view of artist wither her easel painting along riverfront followed by close-up of artist's face; hands on ship wheel followed by close up of woman operating wheel; view from behind of sailboat sailing into sunset along Fraser River; silhouette of small boy and girl standing on globe public artwork at Flight Path Park, as plane flies overhead boy leans and gives girl a kiss, while City logo is superimposed over screen.

Graphics on screen

Slide with City of Richmond logo transitioning to slide with picture of parents with child in a stroller standing sidewalk below Canada Line guideway and looking at smart phone screen

Graphics superimposed on slide include
Richmond logo with text below
Smart Cities Challenge
Richmond, BC
smartcity.richmond.ca

Federal Smart Cities Challenge logo is in bottom right corner.

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IMAGE DESCRIPTIONS - SMART CITIES PROPOSAL

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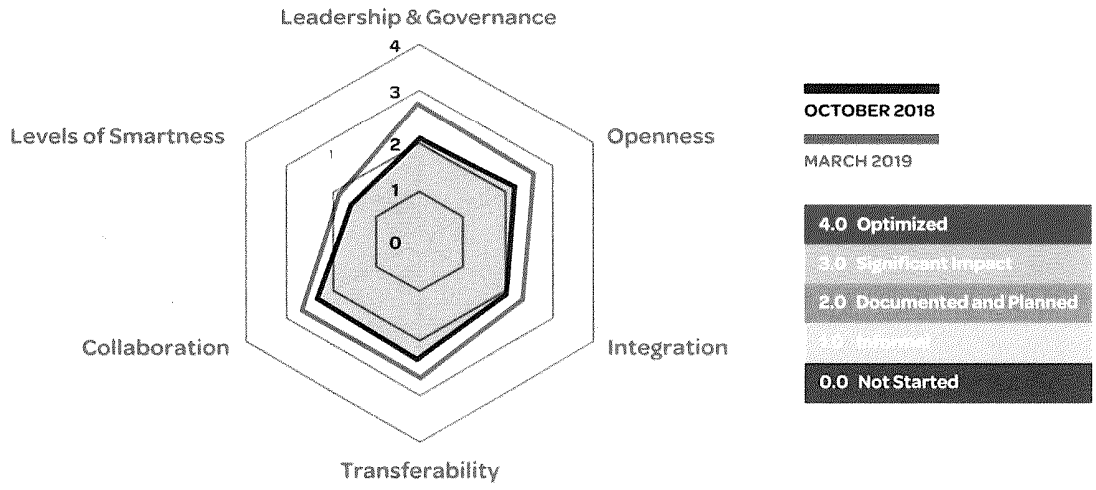

Image Description: A summary of City of Richmond's Smart Cities maturity growth. Scores are as follows:

- Leadership and Governance – 2.0 in October 2018 and 2.8 in March 2019.
- Openness – 2.1 in October 2018 and 2.6 in March 2019
- Integration – 2.0 in October 2018 and 2.4 in March 2019
- Transferability – 2.4 in October 2018 and 2.7 in March 2019
- Collaboration – 2.4 in October 2018 and 2.8 in March 2019

The legend is as follows:
4.0 Optimized
3.0 Significant Impact
2.0 Documented and Planned
1.0 Informal
0.0 Not Started

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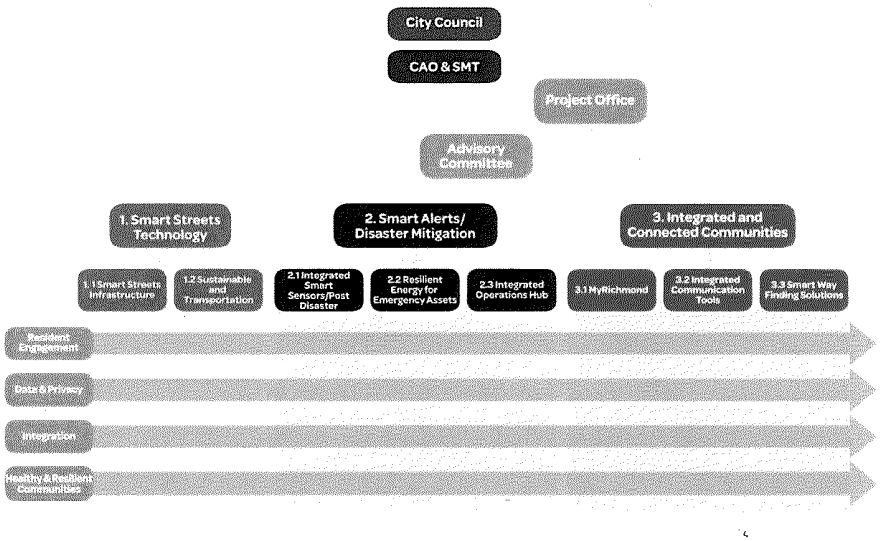

Image Description: Chart describing Richmond's Smart Cities Challenge governance structure

1. City Council
2. CAO and Senior Management Team
3. Project Office
4. Advisory Committee
5. Individual Projects

Horizontal Streams: Resident Engagement, Data and Privacy, Integration, Healthy & Resilient Communities

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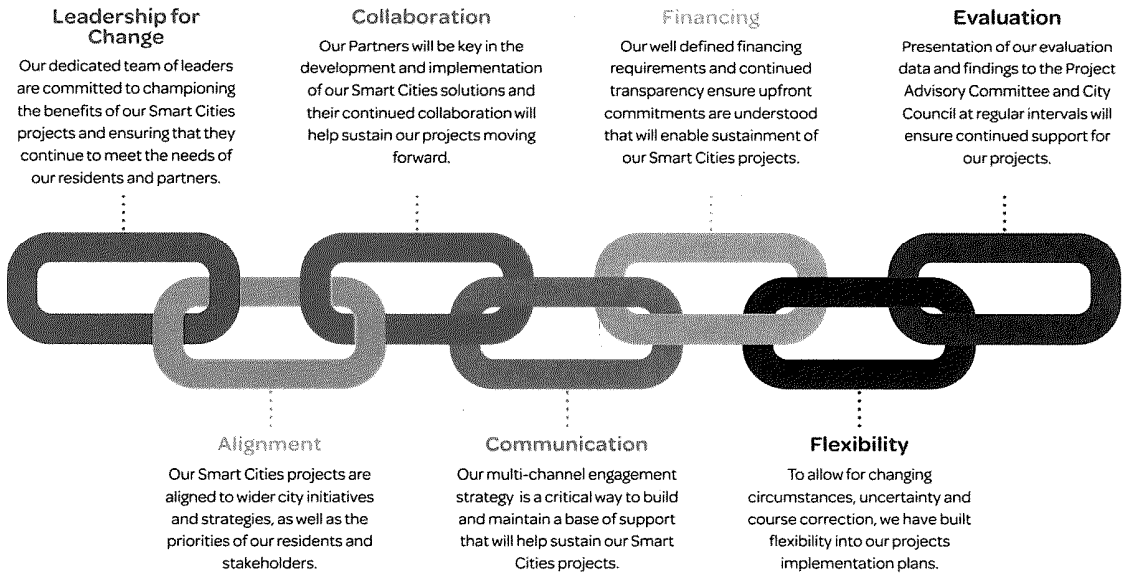

Image Description: Graphic describing our Project Sustainment Strategy

Leadership for Change
Our dedicated team of leaders are committed to championing the benefits of our Smart Cities projects and ensuring that they continue to meet the needs of our residents and partners.

Collaboration
Our Partners will be key in the development and implementation of our Smart Cities solutions and their continued collaboration will help sustain our projects moving forward.

Financing
Our well defined financing requirements and continued transparency ensure upfront commitments are understood that will enable sustainment of our Smart Cities projects.

Evaluation
Presentation of our evaluation data and findings to the Advisory Committee and City Council at regular intervals will ensure continued support for our projects.

Flexibility
To allow for changing circumstances, uncertainty and course correction, we have built flexibility into our projects implementation plans.

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Communication
Our multi-channel engagement strategy is a critical way to build and maintain a base of support that will help sustain our Smart Cities projects.

Alignment
Our Smart Cities projects are aligned to wider city initiatives and strategies, as well as the priorities of our residents and stakeholders.

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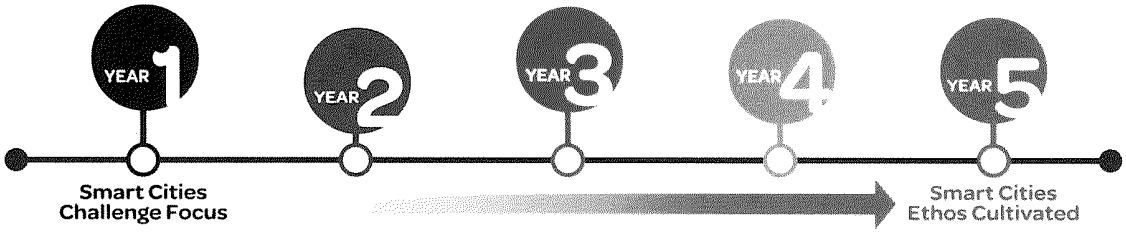

Image Description: Graphic illustrating the corporate integration of Smart Cities principles.

In Year One: Smart Cities Challenge Focus: We will develop our Smart Cities internal processes around the scope of the Challenge.

By Year Five: Smart Cities Ethos Cultivated: Smart Cities principles become an inherent part of the City's culture and how we do business.

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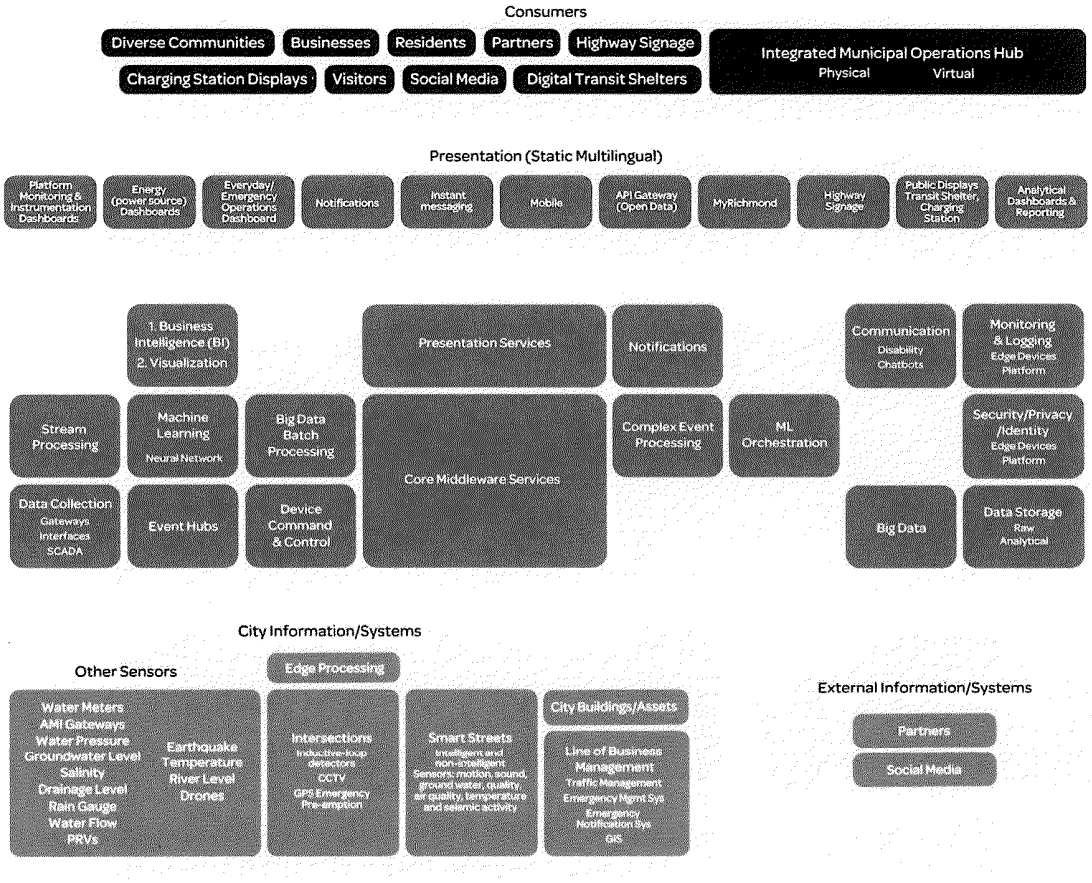

Image Description: Smart Cities High Level architecture.

- **First Layer**: City Information/Systems and External Information/Systems
  - City information/Systems: Edge processing, Smart Streets (Intelligent and non-intelligent sensors; motion, sound, groundwater level, water quality, air quality, temperature and seismic activity sensors); Other sensors, Intersections (CCTC, Inductive Loop Detectors, GPS Emergency Pre-emption); city Buildings/Assets; LOB applications (traffic management, emergency management systems, GIS)
  - External Information/Systems: Partners, Social Media.

- **Second Layer:** Stream processing; data collection (gateways, interfaces, SCADA); data analysis, BI and visualization; machine learning; event hubs; big data batch processing; device command and control; presentation services; core middleware services; notifications; complex event processing; ML orchestration; communication (disability, chatbots; big data; Monitoring and logging (edge devices, platform); security/privacy/identity (edge devices, platform); data storage (raw, analytical).

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- **Third layer:** Presentation.
    - Platform monitoring and instrumentation dashboards; energy dashboards; everyday/emergency operation dashboards; instant messaging; mobile; API gateway; MyRichmond; highway signage; public displays; analytical dashboards and reporting.
- **Fourth Layer:** Consumers
    - Diverse communities; businesses; residents; partners; highway signage; charging station displays; visitors; social media; digital bus shelters; integrated municipal operations HUB.

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Image description: Risk Strategy

1. Identify
2. Analyze
3. Treat
4. Allocate
5. Monitor and report

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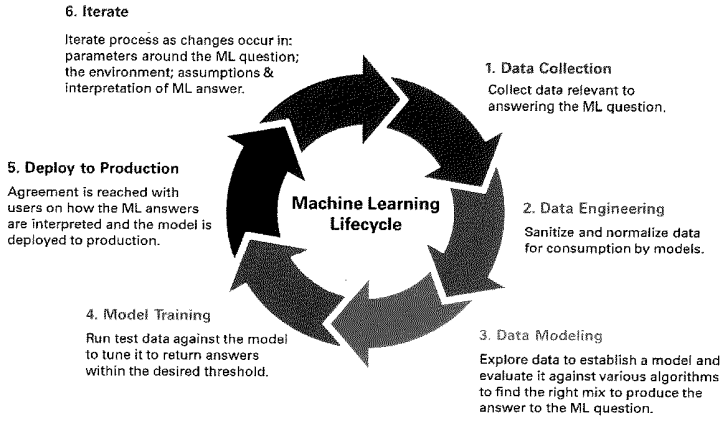

Image description: Machine learning lifecycle

1. Data collection - collect data relevant to answering ML question
2. Data engineering – sanitize and normalize data for consumption by models
3. Data modelling – explore data to establish a model and evaluate it against various algorithms to find the right mix to produce the answer to the ML questions.
4. Model training – run test data against the model to tune it to return answers within the desired threshold
5. Deploy production – agreement is reached with users on how the ML answers are interpreted and the model is deployed to production.
6. Deploy to production – agreement is reached with users on how the ML answers are interpreted and the model is deployed to production
7. Iterate – iterate process as changes occur in: parameters around the ML question; the environment; assumptions and interpretation of ML answer.

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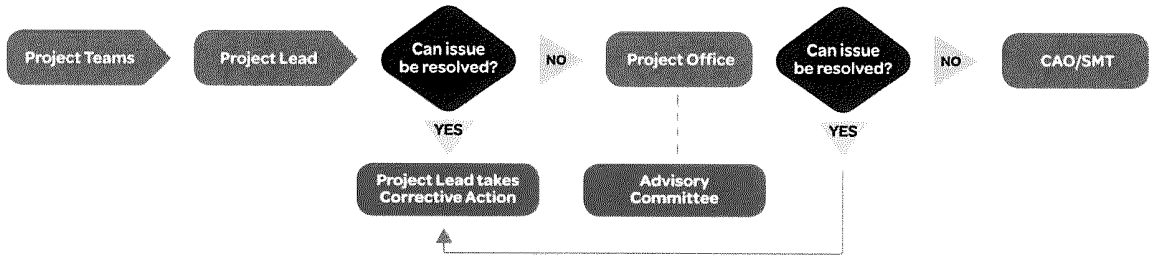

Image description: Escalation Process

The project team escalates issues to the project lead. If the issue can be resolved the project lead takes corrective action, if not the project lead escalates to Project Office. If the issue can be resolved, the Project Office takes corrective action, if not the issue is escalated to the Chief Adminstrative Officer (CAO) and the Senior Management Team (SMT).

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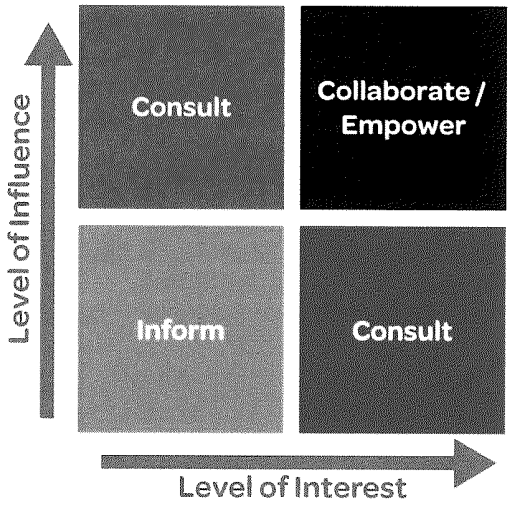

Image description: Stakeholder engagement approach

If level of interest and level of influence are high, collaborate and empower. If level of interest is low and level of influence is low, inform. If level of interest is high and level of influence is low, consult. If level of interest is low and level of influence is high, consult.

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